US TACOM/ARDEC
BATTLEFIELD MAINTENANCE STSTEM ENGINEERING TEAM
DESCRIPTION FOR PURCHASE

FUEL INJECTION PUMP TEST STAND

National Stock Number 4910-01-465-4537

1 SCOPE

1.1 This Description For Purchase describes the requirements for the rebuilding and updating of the Model 8020 Fuel Injection Pump Test Stand (FITS) that was designed and constructed to facilitate the testing and calibration of diesel engine fuel pumps in accordance with the pump manufacturer's specifications. **NOTE: The Test Stand and Chiller rebuilt to this Description for Purchase (DFP) shall be assigned only to U.S. Army Units stationed Outside of the Continental United States (OCONUS).**

NOTE: The Model 8020 FITS was originally manufactured by Bacharach Inc., 625 Alpha Drive, Pittsburgh, PA 15238, in 1985.

2 APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified the following specifications, standards and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation form a part of this Description For Purchase to the extent specified herein.

SPECIFICATIONS

FEDERAL

A-A-59136	Cushioning Material, Packaging, Closed Cell Foam Plate

2 1.2 Other Government documents, drawings and publications. The following other government documents drawings and publications form a part of this Description For Purchase to the extent specified herein.

US DEPARTMENT OF LABOR, OCCUPATION SAFETY & HEALTH ADMINISTRATION (OSHA)

29 CFR Part 1910 - Occupational safety and Health Standards

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402-0001).

(Copies of specifications, standards, handbooks drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following document (s) form a part of this Description For Purchase to the extent specified herein. The issues of the document s which are indicated as DOD adopted shall be the issue listed in the current DODISS and the supplement thereto if applicable.

AMERICAN GEAR MANUFACTURER'S ASSOCIATION (AGMA)

AGMA 390.03	Gear Handbook Volume 1 Gear Classification, Materials and Measuring Methods for Unassembled Gears
AGMA 20000-A88	Gear Classification and Inspection Handbook – Tolerances And Measuring Methods For Unassembled Spur and Helical Gears (Including Metric Equivalents)

(Application for copies should be addressed to the American Gear Manufacturer's Association, 1500 King Street, Suite 201, Alexandria, VA 22314.)

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ASME B1.1	Unified Inch Screw Threads (UN and UNR Thread Forms)
ASME B1.13M	Metric Screw Threads - M Profile
ASME B1.21M	Metric Screw Threads - MJ Profile

(Application for copies should be addressed to The American Society of Mechanical Engineers, United Engineering Center, 345 E. 47th Street, New York, NY 10017)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 112211	Glossary of Gear Terms - Part I: Geometrical Definitions
ISO 54	Cylindrical Gears For General Engineering and For Heavy Engineering, Modules and Diametrical Pitches of.
ISO 4008/1	Road Vehicles - Fuel Injection Pump Testing - Part I: Dynamic Conditions
ISO 4008/2	Road Vehicles - Fuel Injection Pump Testing - Part 2: Static Conditions

ISO 4010	Calibrating Nozzle, Delay Pintle Type
ISO 4113	Road Vehicles - Calibration Fluid For Diesel Injection Equipment

(Application for copies of ISO documents should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J967	- Calibration Fluid For Diesel Injection Equipment

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive Warrendale, PA 15096.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

MG 1	- Motors and Generators

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street NW, Washington, DC 20037.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this Description For Purchase and the references cited herein, the text of this Description For Purchase shall take precedence.

3 REQUIREMENTS

3.1 First article. When specified, the contractor shall furnish one or more Fuel Injection Pump Test Stand (FITS) Systems (see 6.2) for first article inspection. The Test Stands submitted shall be rebuilt in accordance with the requirements of this Specification. The first article may be either a preproduction model or an initial production item, which conforms to the requirements of this Description For Purchase (DFP). In either case, the approved first article and the production items shall be in accordance with the terms of the contract. Approval of the first article shall not relieve the contractor of the responsibility to furnish equipment in accordance with the requirements of this DFP. All items supplied under this contract shall be identical to the first article.

3.2 Rebuild requirements. The Fuel Injection Pump Test Stand (FITS) System consists of the Test Stand, a Chiller, a Flow Console, and the various accessory Kits as specified herein (see 6.2.1). The Test Stand and the Chiller will be provided as Government-furnished property (see 6.3). The Test Stand shall be rebuilt to include current state-of-the-art technologies in the drive motor system and the computer control and display systems. One sample each of the Flow Console, and the required Accessory Kits, including the Master Accessory Kit, will be supplied to the contractor as Government-loaned property (see 6.4), to be used for interface testing of the rebuilt Test Stand with the FITS System. The software shall be replaced by current state-of-the-art, Windows or real time operating systems that provides the necessary control and display requirements, self-diagnostic testing (see 3.4.11), operator controlled FITS systems trouble shooting, operator self-training, and a modem for interface with Personal Computer (PC) systems. All software developed as a part of this contract shall be owned by the Government to do with as the Government sees fit. The chiller shall be refurbished and the refrigerant drained and replaced with a non-ozone-depleting type refrigerant. The chiller may remain as a stand-alone component or be integrated into the Test Stand frame, at the Contractors option. Components not replaced as a part of the rebuild effort shall be tested and inspected to determine their ability to function in accordance with the rebuilt system requirements stated herein. The rebuilt test stand shall test fuel injection pumps as required herein.

3.3 Design.

3.3.1 Fuel injection pump test stand. The fuel injection pump test stand (FITS) shall test the following pumps with the appropriate adapter kit, in accordance with pump manufacturer's specifications, without damage to the pumps or the fuel injection pump test stand. In the case of Caterpillar pumps, the engine on which the pump is used is listed in lieu of the pump.

Simms	Cummins	Navistar
P5184/1	PT (all types)	270243R91 (Model B Twin Plunger) 328087R91

Caterpillar	AMBAC	Stanadyne	Robert Bosch	Lucas CAV
D333C(1673)	APE6BBl00	D	PES3A	DPA
D343TA(1693)	APE6BB90Q	DB	PES6A	3249FO10
D342(1674)	PSB6A90EH	DC	PES6P	3044494R92
3406B	PSB4Al10EH	JDB	PES5MW	3248F391
3208	PSB12BT	DB2829YL4267	PES6MW100	3241F940
3306	PSU2/4A-80E-9328			
3406	1006Al00A			
3408				
3306B				

3.3.2 FITS operational requirements. The FITS shall be floor mounted and shall test fuel injection pumps that deliver up to 400 cubic millimeters/stroke/cylinder at full load, at 550 revolutions per minute in accordance with the injection pressure criteria of ISO 4008/1. Should any fuel injection pump and test stand interface change the contractor shall provide the required interface kits. The FITS shall drive pumps either clockwise (CW) or counterclockwise (CCW). The FITS shall be capable of testing the specified pumps when filled with the appropriate calibration fluid and lubrication oil and is connected to the appropriate electrical or electrical and air power source(s). The FITS shall operate as described herein when equipped with all the required instrumentation, controls, and pump coupling device(s), utilizing the appropriate adapter kits. The FITS shall be floor mounted, of rigid metal frame construction, and designed IAW ISO 4008/l and 4008/2 with the exception of the calibration fluid temperature control (see 3.4.2 and 3.4.6.9) and the calibration fluid measuring system (see 3.4.10). The mounting configuration of the test stand for each pump and its adapter kit shall meet or exceed the stability requirements of para 5.1.6 of ISO 4008/1. Any contractor supplied adapter kits shall be complete with all hardware required to successfully operate the related pump in accordance with the pump manufacturer's instructions. Internal voltage reduction to operate specific electrical circuits shall be incorporated as applicable. Pressurized fluid systems shall be configured to withstand pressure to prevent component damage, degradation, rupture and failure. The FITS shall be furnished with a metal container with pocketed foam for storage of all contractor furnished adapter kits provided with the stand. The foam material shall conform to A-A-59136. Each component shall be separately identified.

3.3.3 Original FITS Adapter kits Original FITS Adapter Kits will be provided as Government-loaned property to be used with each Model 8020 FITS that is to be rebuilt. The loaned Adapter Kits includes one each of the following.

3.3.3.1 Cummins pump kit.

a. Kit for PT pumps (all types).

b. Flow panel (as required for above Cummins pumps).

3.3.3.2 Stanadyne pump kits.

a. Kit for D, DB, DC, and JDB pumps (nozzles per para 3.2..2.4 not furnished as a part of this kit).

b. Kit for DB2829YL4267 pump (8 calibrated test nozzles shall be furnished as part of this kit).

3.3.3.3 AMBAC pump kits.

Kits for PSB6A90EH, PSB4A110EH and PSB12BT pumps (nozzles per para 3.3.2.4 not furnished). Matching sets of test nozzles for the PSB12BT and PSB6A90EH pump shall be furnished with the kit. They are AMBAC part numbers KT-7831 (set of 16 nozzles) and KT7830 (set of 8 nozzles).

3.3.3.4 Calibrating nozzles and holders.

Six each, calibrating nozzles and holders, in accordance with ISO 4010.

3.3.4 Safety and health requirements. The fuel injection pump test stand shall comply with the general safety and health requirements promulgated under 29 CFR Part 1910, OSHA Standards that are applicable to the stand itself. Safety devices shall be provided for all parts presenting safety hazards.

3.4 Components. The FITS shall consist of, but not be limited to, the following major components:

a. Main drive assembly (see 3.4.1).

b. Calibration fluid supply system (see 3.4.2).

c. Lubrication oil system (see 3.4.3).

d. Pump coupling device (see 3.4.4).

e. Instrumentation system (see 3.4.5).

f. Control System (see 3.4.6).

g. Interconnect system (fuel lines, lube oil lines and connections) (see 3.4.7).

h. Injector mounting rack (see 3.48).

i. DC voltage supply (see 3.4.9).

j. Fluid measuring system (see 3.4.10).

k. Self-diagnostic system (see 3.4.11).

l. Hour meter (see 3.4.12).

m. Bedplate (see 3.4.13).

n. Regulated air supply (see 3.4.14).

o. Software for self training and fault diagnostics(see 3.4.15).

3.4.1 Main drive assembly The main drive assembly shall be capable of driving all pumps listed in 3.3 1 in accordance with pump manufacturer test criteria. The main drive motor shall drive all pumps from 50 up to 5,000 rpm with a rate of acceleration/deceleration of no less than 200 rpm/second (sec). Speed droop shall not exceed 5 per cent when the output load is increased from zero to maximum. The motor shall conform to the requirements of NEMA MG-1. The FITS shall meet the requirements specified herein when operating from 3 phase, 60 Hz, 208/220 volts plus or minus 10 per cent, and 3 phase, 50 Hz, 380 volts plus or minus 10 per cent.

3.4.2 Calibration fluid supply system.

3.4.2.1 Calibration system requirements. The pump calibration fluid supply system shall utilize SAE J967 (ISO 4113) fluid. The calibration fluid system shall supply fluid to the injection pump at a rate of up to 300 gallons per hour (gal/hr) with a pressure of 85 pounds per square inch gage (psig) and a calibration fluid temperature of 38 degrees C to 49 degrees C. The FITS shall have means for determining the volume of calibration fluid in the reservoir without removal of panels.

3.4.2.2 Reservoir. The calibration fluid shall be stored in a closed reservoir with a capacity of no less than 13 gallons, with filler hole, drain valve and a sludge trap with magnet. The reservoir shall permit easy access to the heater for removal. The fluid shall be filtered thru a 10-micron primary filter and a 3-micron secondary filter; both located in the fluid exit line outside of the reservoir prior to input to the fuel injection pumps. The filter ratings shall be based on a differential pressure of 4 inches of mercury across a new filter at a 2 gallons per minute (gpm) flow rate. The filters shall be of the spin-on type.

3.4.2.3 Waste fluid reservoir. The waste fluid shall be collected separately and deposited in a waste fluid reservoir mounted within the machine with a capacity of no less than 4 gallons. The waste fluid reservoir shall be capable of being drained from the exterior of the test stand without removing machine panels.

3.4.2.4 Calibration fluid system temperature requirements. The temperature of the calibration fluid shall be thermostatically controlled and adjustable between 38 degrees Celsius (C) and 49 degrees C, for a surrounding temperature range from 0 degrees C to 49 degrees C, with an accuracy throughout the temperature range of plus or minus 1 degree C. This will require heating and cooling. The surrounding air temperature during the test shall be no less than 38 degrees C, with the pump operating on a 40 minute cycle of 10 minutes on and 30 minutes off, for a total test period of four hours. Means shall be provided to prevent heater burnout due

to lack of fluid. The closed loop cooling system shall have the capacity to limit the calibration fluid temperature to no more than 41 degrees C, while the FITS is testing the largest capacity pump of paragraph 3.3.1. As a part of the rebuild effort, the chiller refrigerant shall be drained and replaced with a non-ozone-depleting type. The cooling system may remain as a stand-alone chiller or be incorporated into the Test Stand.

3.4.3 Lubrication oil system. The lubrication oil shall be stored in a closed reservoir with a capacity of no less than 4 gallons, with filler hole, drain valve, and drain. The lubricating oil system shall utilize SAE 30 lubrication oil and shall be capable of supplying lubricating oil at flow rates up to 55 gal/hr at a pressure of 75 psig plus or minus 1 per cent throughout the flow range. The FITS shall have a means for determining the volume of lubricating oil in the reservoir without removal of panels. The reservoir shall have a thermostatically controlled electrical heating device, which will operate simultaneously with the lubrication oil supply pump. The device shall maintain the lubrication oil at temperatures between 67 degrees C and 73 degrees C in an ambient temperature range of 0 degrees C to 49 degrees C, with no injection pump being driven. The reservoir shall permit easy access to the heater for removal. The lubrication oil shall be filtered thru a 10 micron, in line, spin-on type filter located in the exit line outside of the reservoir.

3.4.4 Pump coupling device. The coupling device and drive allows for connecting all of the pumps specified in 3.3.1 to the FITS utilizing the appropriate adapter kit. The coupling is directly attached to the drive shaft incorporating a pilot to assure concentricity and alignment. The coupling output flange dimensions are in accordance with Figure 1. If another type of coupling is used, adapters shall be furnished to interface with the existing adapters when testing fuel injection pumps.

3.4.5 Instrumentation system. Instrumentation shall be provided to indicate the calibration parameters as specified by the various manufacturers for all pumps specified in 3.3.1. Indications shall be provided that are easily read by an operator with 20/20 eyesight, standing at a distance of five feet. The instrumentation system shall have the capability to simultaneously monitor from 1 up to 12 pump outlets and shall include a microprocessor controlled graphical and digital type display in combination with a printer to document salient data. The Instrumentation System shall include an industry standard Personnel Computer (PC) with a Windows or real time Operating System that includes an automated testing capability. The software provided with the PC and the Instrumentation system shall be capable of being updated. All time base instrumentation shall be of the crystal type. All dial type gages shall be no less than 4 inches in diameter. The indicators shall consist of, but not be limited to, the following.

3.4.5.1 Visual display monitor. The following data shall be visually displayed simultaneously on a readout screen.

a. Flow rate for each pump outlet displayed graphically and digitally along with a digital indication of vertical scale.

b. Average flow rate of all pump outlets displayed digitally.

c. Horizontal lines displaying upper and lower delivery limits.

d. Number of pump outlets being monitored.

e. Units of measurement.

f. Digital and analog display of driveshaft RPM (see 3.4.5.2).

g. Digital and analog display of calibration fluid temperature (see 3.4.5.3).

h. Digital and analog display of lubrication oil temperature (see 3.4.5.4).

i. Digital and analog display of calibration fluid pressure and vacuum (see 3.4.5.5).

j. Digital and analog display of transfer pump pressure (see 3.4.5.6).

k. Digital and analog display of housing fluid pressure (see 3.4.5.7).

l. Digital and analog display of lubrication oil pressure (see 3.4.5.8).

m. Digital and analog display of injection pump gallery pressure (see 3.4.5.9).

3.4.5.2 Driveshaft speed. The indicated speed range shall be no less than 50 to 5,000 rpm and shall be displayed digitally on the screen. This measurement shall be accurate to plus or minus one rpm, and updated once every second.

3.4.5.3 Calibration fluid temperature. The calibration fluid temperature display shall indicate temperatures within a range of no less than 38 degrees C to 49 degrees C and shall be accurate to plus or minus one degree. The temperature indicating transducer shall be located in proximity to the panel outlet.

3.4.5.4 Lubrication oil temperature. The lubrication oil temperature display shall indicate temperatures within the range of no less than 38 degrees C to 71 degrees C and shall be accurate to plus or minus three degrees. The temperature shall be measured in the pump supply line behind the bulkhead connector on the panel.

3.4.5.5 Combination display. A combination vacuum and pressure display shall indicate no less than 0-30 inches of mercury vacuum when the suction mode is used for calibration fluid supply and shall also indicate no less than 0-100 psig for calibration fluid pressure supply. The accuracy of this display shall be plus or minus one percent of reading or plus or minus 0.5 psi whichever is greater.

3.4.5.6 Transfer pump pressure display. A display shall indicate transfer pump pressure of no less than 0 to 150 psig with an accuracy of plus or minus one psig.

3.4.5.7 Pump housing fluid pressure display. A display shall be provided to indicate injection pump housing fluid pressure. The display shall indicate pressures of no less than 0 to at least 30 psig with an accuracy of plus or minus one psig.

3.4.5.8 Lube oil pressure display. A pressure display shall indicate the lube oil pressure. The display shall indicate pressures of no less than 0 to no less than 150 psig with an accuracy of plus or minus one psig.

3.4.5.9 Injection pump gallery pressure. A display shall indicate injection pump gallery pressure of no more than 0 to no less than 150 psig with an accuracy of plus or minus one psi.

3.4.5 10 Printer. The FITS shall incorporate a printer for providing hard copy reports. The printer shall be of such size and type that will provide a legible and permanent record of the following data:

a. Pump speed.

b. Pump outlet number along with corresponding individual outlet delivery rate and average rate of deliveries.

c. Unit of measure.

d. A header that allows space for the operator's name, the pump type and serial number, and the date to be written on the tape.

3.4.5.11 Pressure phasing. A pressure indication shall be provided for the pressure-phasing mode, indicating no less than 0-1000 psig in 20 psig increments with an accuracy of plus or minus 1 percent of full scale value.

3.4.6 Control system. The Control System shall be furnished with an Industrial Grade, dirt resistant keyboard for inputting data into the system and an Industrial Grade modem for interfacing with other computer terminals, both on-site and off-site. The Control System shall provide all control functions, as listed in 3.4.6.1 thru 3.4.6.11, however the specific device may not be required due to rebuild improvements. All controls shall be located for ease of operator usage. All controls shall be legibly marked for identification and function. The controls shall consist of, but not be limited to; those delineated in 3.4.6.1 thru 3.4.6.11 herein.

3.4.6.1 Main drive start button. The main drive start button shall be console mounted and shall be limited to the start of the main drive motor. Speed control interlocking shall be provided as required to preclude damage to the FITS and injection pumps during start-up.

3.4.6.2 Main drive stop switch. A main drive stop switch shall be furnished to deactivate the main drive motor.

3.4.6.3 Speed controller. The speed controller shall provide for infinitely variable speed range control from 50 to no less than 5,000 rpm. The speed controller shall be through the computer system and shall clearly indicate direction of the driver as either CW or CCW. An interlock shall be provided to prevent start-up or change of direction at other than zero speed.

3.4.6.4 Emergency stop buttons. Two emergency stop buttons shall be provided, one on either side of the control panel, allowing for easy operator access. Either button shall be capable of removing electrical power from the main motor, and prevent restart until the emergency stop button is reset.

3.4.6.5 Calibration fluid pump start switch. A switch shall be provided to start and stop the calibration fluid pump and simultaneously turn on and off the fluid reservoir temperature controls. A second switch shall be provided if a separate high pressure pump and drive motor is utilized for timing and phasing.

3.4.6.6 Pressure control valves. Separate control valves shall be available for calibration fluid supply and pressure phasing.

3.4.6.7 Lubrication oil pump start switch. A switch shall be furnished to activate and deactivate the lubrication oil pump if a separate drive motor is used.

3.4.6.8 Lubrication oil pressure control valve. A control valve shall be available for varying the lubrication oil supply pressure.

3.4.6.9 Calibration fluid temperature controller. An adjustable calibration fluid temperature controller shall be included. The temperature controller shall be capable of automatically maintaining the calibration fluid temperature at any set temperature between 38 degrees C and 49 degrees C plus or minus one degree C. A light shall be furnished to indicate when the calibration fluid control temperature has been obtained.

3.4.6.10 DC voltage controller. A voltage controller shall be furnished to vary the DC voltage from no less than 0 to 30 VDC.

3.4.6.11 Stroke count controller. A stroke count controller shall be furnished to preset the number of strokes (pump drive shaft turns) at no less than 25, 50, and 100 strokes and shall contain a start of count control switch to initiate count.

3.4.7 Interconnect system. Specific connection capabilities and panel connectors existing in the Model 8020, that satisfy the connection requirements of all pumps listed in 3.3.1, are delineated in paragraphs 3.4.7.1 through 3.4.7.9. The contractor shall provide all interfacing hardware required due to changes resulting from the rebuild.

3.4.7.1 Calibration fluid supply and return connections. The calibration fluid supply and return lines shall be capable of supplying calibration fluid at a pressure no less than 100 psig and returning calibration fluid to the supply reservoir as well as furnishing a vacuum for testing the suction of pumps which require vacuum for their operation. The calibration fluid supply lines shall be the flexible type hose, capable of dissipating pressure surges created by the metering action of the injection pump and preferably should be transparent for observation of flow. The panel shall have no less than one calibration fluid supply and no less than three calibration fluid returns. These connectors shall be either Hansen Coupling Div, Tutthill Corp part number 3-S20 NK or Foster Mfg. Co., Inc. part number 38 MS or equivalent in form, fit and function.

3.4.7.2 Lubrication oil supply and return connections. The lube oil supply system shall supply lube oil at pressures no less than 100 psig. The panel connector for lube oil supply shall be a Hoffman Engineering Co., Inc. part number MA2-BC or equivalent in form, fit and function. A 5/8 inch OD metal tube shall be provided as a nipple in the drain tray for connecting the lube oil return line from the pump to the nipple to return lube oil to the reservoir.

3.4.7.3 Pressure phase and back leakage connections. Calibration fluid supply and return lines and connections shall be provided to allow checking the pressure phasing as part of the injection pump timing procedure and injection pump leak off return (back leakage) to the flow meter. The high pressure phasing supply line(s) and connection(s) shall be capable of withstanding a pressure of 1000 psig. A calibration fluid return line shall be provided to the reservoir and to the flow meter for measuring back leakage. The flowmeter shall have a range of 10-570 cc/min. and an accuracy of two-percent full scale at a fluid temperature of 49 to 51 degrees C. The connectors for the high pressure phasing supply shall be a Hansen Coupling Div, Tuthill Corp, part number 1-Hil series 1-HK. The connectors for the calibration fluid return line to the reservoir and flow meter shall be a United Technologies Automotive Components Div part number 870 x 8 or Aeroguip Corp, Industrial Div part number 2239-6-8S or equivalent in form, fit and function. The connectors for the calibration fluid back leakage to the flowmeter shall be Parker Part No. 22BH-4-4 or equivalent in form, fit and function.

3.4.7.4 Transfer pump pressure connector. The connector for the 0 to 150 psig transfer pump pressure indicator shall be a Hoffman Engineering Co., Inc. part number M1-M-C or equivalent in form, fit and function.

3.4.7.5 Pump housing fluid pressure display connector. The connector for the 0 to 30 psig pump housing fluid pressure display shall be a Hoffman Engineering Co., Inc. part number Ml-M-C or equivalent in form, fit and function.

3.4.7.6 Connectors for final stage filter. The connector for calibration fluid both to and from the final filter shall be either a Hansen Coupling Div, Tuthill Corp part number 3-S20 Nk or a Foster Mfg. Co., Inc. part number 38 MS or equivalent in form, fit and function.

3.4.7.7 Cummins supply connection. The Cummins calibration fluid supply shall be a male connector for 3/4 I.D. clear PVC pressure tubing.

3.4.7.8 DC voltage control connectors. The connector for the 0 to 30 VDC voltage control shall be a Concord Electronics Corp part number 01-1501-1-0200 or equivalent in form, fit and function.

3.4.7.9 Connector for regulated air supply. The connector for the regulated air supply shall be a Hoffman Engineering Co., Inc. part number MAI-BC or equivalent in form, fit, and function.

3.4.8 Injector mounting rack. The injector mounting rack shall be capable of mounting from 1 up to 12 holders and injectors. The rack shall accommodate, as a minimum, the injectors required for testing all of the pumps listed in 3.3.1 in accordance with manufacturer specifications. The injector mounting rack shall afford access to the pump from both sides and

the front of the test stand, i.e., shall be movable to the right or left side of the machine as viewed from the machine front. The lateral position of the injector mounting rack shall be adjustable within the range of 6-1/2 to 9 inches right or left of centerline of the pump drive. The top of the injector mounting rack shall be between 18 to 20 inches above the surface of the bedplate.

3.4.9 DC voltage supply. A 300 watt, variable, fully rectified, DC voltage supply shall be furnished, providing amperages up to 10 amps and voltages up to 30 VDC. The DC supply shall maintain the selected voltage within plus or minus 3 per cent over the range of 5 to 30 volts and plus or minus 0.15 volt below 5 volts. A meter shall be furnished to indicate output voltages and shall be accurate within plus or minus 1 percent of full scale' value. An electrical receptacle shall be provided on the control panel for connection of injection pump solenoid valves or other components.

3.4.10 Fluid measuring system. The fluid measuring system shall be of the positive displacement type. The flow rates indicated by the measuring system shall be accurate to one cubic millimeter/stroke or less, or to within 2 per cent of the true flow rate, whichever is greater.

3.4.11 Self diagnostic system. The FITS shall incorporate the capability for self-diagnostics of electronic systems. The self-diagnostics system may be integral within the FITS or may be accomplished by a separate indicator. The self-diagnostics system shall also contain the capability for self-evaluation, that is, shall indicate its own proper functioning as well as indicating an internal fault. The fault indication shall provide, as a minimum, a starting point that will enable an electronic technician, with the aid of the FITS technical manual, to isolate the fault to the printed circuit board level.

3.4.12 Hour meter. A total time lapse hour meter shall be provided indicating total operating time of the main drive motor for maintenance purposes.

3.4.13 Bedplate. The FITS shall be equipped with a steel bedplate no less than 7.75 inches wide. The bedplate shall have a longitudinal T-slot for aligning and clamping injection pump mounting brackets. The T-slot shall be centered on the vertical plane passing through the center of the pump drive and sized to fit a 3/8 inch x 16 x 1/2 inch steel T-slot nut. The throat of the T-slot shall be 0.503 +0.002 -0.000 inch wide to align the mounting brackets by accepting and maintaining a sliding fit with a 0.500 +0.002 -0.000 inch wide key machined in the pump brackets. The vertical distance from the surface of the bedplate to the centerline of the pump drive shall be 11.2500 $\pm$0.0025inches. Provisions shall be provided for draining of the T-slot.

3.4.14 Regulated air supply. The FITS shall have a filtered, compressed air supply regulated from 0 to 30 psi gage (psig) when connected to shop air.

3.4.15 Software for self training and fault diagnostics. Software shall be provided to teach a new operator how to operate the system and perform successful tests without the presence of an in-person instructor. The software shall also provide diagnostic and trouble shooting functions, allowing the operator to check the FITS systems and determine the source of the problem. Operator Training and Trouble shooting programs shall be provided by a CD ROM system. The software shall allow off-site contractor personnel to view the system parameters and assist the operator in effecting a solution.

3.5 Design and construction. All components added during the rebuild of the 8020 Test stand shall be designed to conform to the requirements that are listed herein. The rebuilt unit shall provide ready access to components for adjustments, replacement or repair, and to facilitate setup, operation, and maintenance without the need for special tools. The machine shall be complete so that when installed and connected to the specified power source, it can be used for its intended operation. The FITS shall be constructed in such a manner as to allow the individual components to maintain the required performance, accuracy, and function when operated at its maximum functional capacity. The Monitor shall be protected by an oil and break resistant, transparent screen. Components added as a part of the rebuild effort shall be designed and constructed for ease of maintenance. Electronic devices shall incorporate the use of plug-in type circuit boards. Where practical, each circuit board shall be limited to a single function. Each circuit board shall include test points in addition to the self-diagnostics specified in 3.4.11.

3.5.1 Interchangeability. All parts shall be manufactured to specific standards permitting replacement or adjustment without modification of the FITS or any of its parts.

3.5.2 Material. Materials not specifically designated herein or in the contract shall be of a quality commensurate with commercial practice within the injection test stand industry, shall be suitable for the intended purpose in the design of the end item, and shall meet all requirements specified herein. Materials shall be free from defects that would adversely affect the performance or maintainability of the individual components or the overall assembly. When dissimilar metals are used in contact with each other, suitable protection against galvanic corrosion shall be applied.

3.5.2.1 Reclaimed materials. The contractor is encouraged to use reclaimed materials for fabricating new parts without jeopardizing the chemical and physical properties, design integrity, and intent of the materials originally selected or specified. The reclaimed materials shall have been reprocessed, remanufactured, or recycled in a manner that shall restore them to the same chemical composition and physical properties as the materials originally selected for use. The use of reclaimed parts as is, or rebuilt from scrap or other used equipment shall not be permissible. Components not replaced as a part of the rebuild effort may be retained, when proved to be fully functional after appropriate inspection and testing. Excess parts remaining after the rebuild of each Fuel Injection Pump Test Stand shall be reported to the Government for disposition.

3.5.3 Welding, brazing and soldering. Welding, brazing and soldering shall be employed only where those operations are included in fabrication of the original design. These operations shall not be employed as repair measures for defective parts.

3.5.4 Fastening devices. All screws, pins, bolts, and similar parts shall be installed with means for preventing loss of tightness. Such parts shall not be swaged, peened, staked, or otherwise permanently deformed unless the design so directs and the deformation will not prevent maintenance or replacement.

3.5.5 Surfaces. All surfaces of castings, forgings, molded parts, stampings, and welded parts shall be cleaned and free from sand, dirt, fins, sprues, scale flux, and other harmful or

extraneous materials. External surfaces shall be smooth and all edges shall be either rounded or beveled, except where a sharp edge is required by design.

3.5.6 Threads. All threads shall conform to ASME B1.1 for Unified Inch threads and B1.13M or B1.21M for Metric threads.

3.5.7 Gears. All gears and pinions used in the test stand shall be designed and manufactured of a suitable material to meet or exceed the requirements of AGMA 390.03 and AGMA 2000, or ISO 54 for the metric (SI) system. The gears shall be of the proper width, size and hardness to transmit full rated torque and horsepower throughout the speed ranges.

3.5.8 Lubrication. All bearings (except sealed-for-life type), mating gears, and sliding parts shall be provided with a means for lubrication. All oil holes, grease fittings, and filler caps shall be accessible without requiring disassembly of the functional parts. FITS offered for acceptance shall be oiled, greased, and lubricated so it can be put into operation without further lubrication. Lubrication reservoirs, if applicable, shall have means for checking levels

3.5.9 Lubrication chart or plate. A lubrication chart or plate shall be securely attached to the unit. The chart shall be placed in a transparent plastic folder or laminated between clear plastic sheets and permanently sealed and provided with suitable means for mounting on the unit. The chart or plate shall provide the following information:

Points of Lubrication
Service Interval
Type of Lubrication
Viscosity

3.5.10 Dials and instruments. Dials shall be permanently and legibly marked, and shall have a non-glare finish on the surface visible to the operator. Instrument faces shall be mounted on the front of the panel where the instrument readings are required for testing. Instrument faces that are used for set up purposes only shall be located adjacent to the point of adjustment (control point). Each instrument shall be marked as to its function.

3.6 Painting. Any painting and finishing required as a result of this rebuild effort shall be in accordance with the manufacturer's best commercial practice, provided the following criteria are met or exceeded. All surfaces to be painted shall be cleaned to be free of any foreign matter detrimental to painting and at least one coat of primer (or a phosphate or chromate base) and one coat of enamel, or equivalent (i.e., epoxy enamel) is applied. Unpainted metal and marking surfaces exposed to atmospheric conditions shall be finished to resist corrosion. The type of finish applied shall be compatible with the base metal.

3.7 Workmanship. The machine and accessories shall have a good general appearance as evidence of high caliber workmanship and shall conform to a quality of construction commensurate with the requirements specified herein and with the best quality prevailing among manufacturers normally producing equipment of the type specified herein.

3.8 Nameplate. A corrosion resistant nameplate(s) shall be permanently attached to the machine. All lettering shall be in capitals and the numerals shall be Arabic (except the model number shall be the manufacturer's customary designation). Letters and numerals shall be of such a size as to be clearly legible. The nameplate shall show the following information:

Nomenclature
Manufacturer's Name
Manufacturer's Model Designation for the Rebuilt Unit
Manufacturer's Serial Number
Power Input Characteristics and Rating
Contract Number
National Stock Number (NSN) – 4910-01-465-4537
Original Date of Manufacture
Date of Rebuild

3.9 Master accessories. Each rebuilt test stand shall be furnished with master accessories, which are basic to all pumps listed in 3.3.1, but are not peculiar to any one pump and are required as an interface between the existing accessories and hardware installed as a part of the rebuild effort. The master accessories shall be furnished in a metal container with a hinged lid. Each container shall be partitioned to prevent movement of the contents during transportation (see 3.3.2). A list of the contents shall be attached to the interior of the lid. The list shall indicate the component location within the container. Each component shall be illustrated for ease of location either on the attached list or in a separate enclosed listing. Assembly instructions shall be included for multi-piece items that require assembly for use.

3.9.1 Component marking. Each component shall be separately identified and keyed to an illustration. Marking of components shall be as follows:

a. Hoses shall have the part number stamped or embossed on a metal band affixed to the hose.

b. Components, other than attaching hardware, shall be stamped, etched or engraved with the part number if sufficient surface is available; and form, fit, function, or mating is not affected; and if the component will not be damaged by marking.

c. Components that can not be stamped, engraved or etched shall be marked by a metal tag wired to the component, by machine printed oil-resistant Mylar tape affixed to the part, or, as a last resort, by placing in a marked cloth bag.

d. Components that are part of an assembly shall be marked with their own unique part numbers, not the assembly number. Instructions for assembly and use shall be included.

e. Unmarked vendor components shall be marked with the contractor's part number.

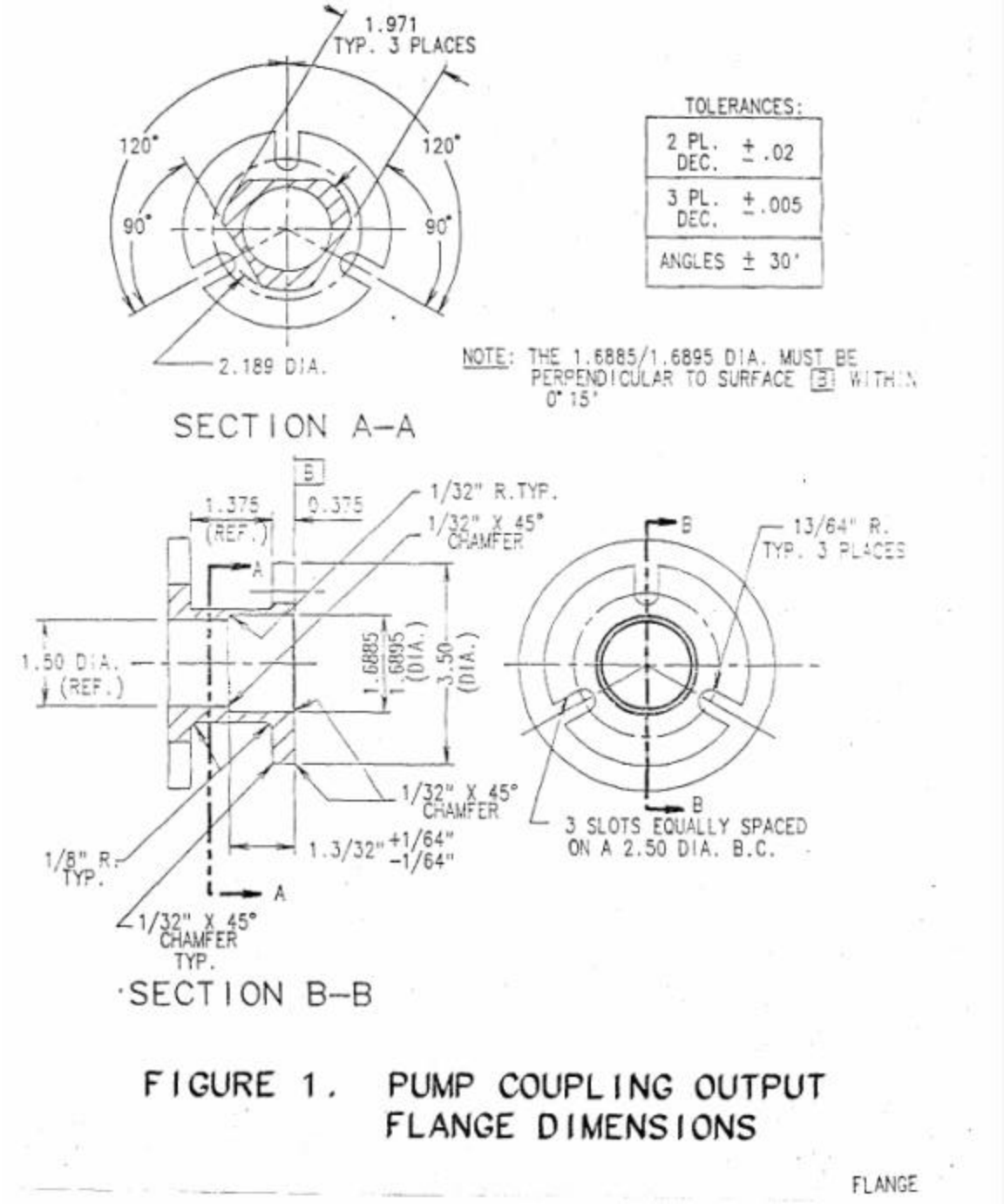

FIGURE 1. PUMP COUPLING OUTPUT FLANGE DIMENSIONS

FLANGE

4. VERIFICATION

4.1 General provisions. The inspections (examinations and tests) herein shall be performed to determine whether the item conforms to Section 3 of this specification.

4.1.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.2)
b. Conformance inspection (see 4.3)

4.1.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified herein.

4.2 First article inspection.

4.2.1 Submission The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with the specified verification methods of Table 1. The first article sample shall consist of a minimum of 1 complete FITS (see 6.2).

4.2.2 Inspections to be performed. As determined by the Government, the first article assemblies, components and test specimens may be subjected to any or all of the verification methods specified (see Table 1). Unless otherwise specified, all the inspections shall be performed.

4.2.3 Rejection. If any test assemblies, test specimen or test components fails to comply with any of the applicable requirements, the first article sample shall be rejected. The Government reserves the right to terminate inspection upon any failure of a test assembly, specimen or component to comply with any of the requirements.

4.3 Conformance inspection.

4.3.1 Compliance. Conformance inspections shall be applied to production units being offered for acceptance under the contract. These inspections shall include all verifications listed in Table 1.

4.3.2 Inspection lot formation. Lot formation shall be in accordance with Section 4 of MIL-STD-1916.

4.3.3 Sampling plan determination. Conformance verification methods are specified in Table 1. When required by contract or cited herein, attribute sampling inspections shall be conducted in accordance with MIL-STD-1916 using verification levels specified in the contract or purchase order.

4.3.4 Rejection Failure of any unit to pass any verification shall be cause for rejection of the unit.

4.4 Rebuild requirements. Verify that the FITS System meets the requirements cited in paragraph 3.2.

4.5 Design.

4.5.1 Fuel injection pump test stand. Demonstrate that the FITS complies with the requirements of paragraph 3.3.1. for all of the pumps listed therein.

4.5.2. FITS operational requirements. Provide objective evidence that the FITS conforms to the requirements of paragraph 3.3.2.

4.5.3 .Original FITS Adapter kits. Verify that one each of the Adapter Kits with accessories listed paragraphs 3.3.3.1, 3.3.3.2, 3.3.3.3 and the nozzles and holders of paragraph 3.3.3.4 are provided for each of Model 8020 FITS to be rebuilt. Examine each of the Adapter Kits for completeness and usability.

4.5.4. Safety and health requirements. Verify that the FITS complies with the applicable general safety and health requirements of OSHA Standard 29 CFR Part 1910. Further verify that safety devices are provided for all parts that present safety hazards.

4.6. Components. Examine the FITS to determine conformance with the requirements of paragraph 3.4.

4.6.1. Main drive assembly. The FITS shall be subjected to a dynamic test utilizing each of the pumps listed in paragraph 3.3.1 Testing shall be performed in accordance with ISO 4008-1, paragraph 5.2 with the FITS operating on 3 phase, 60 Hz, 208/220 volts plus or minus 10 percent and on 3 phase, 50 Hz, 380 volts plus or minus 10 percent. Verify that the FITS main drive assembly accomplishes the following under both sources of power for all pumps tested.

a. Drives pump from 50 up to 5,000 rpm with a rate of acceleration/deceleration of no less than 200 rpm/second (sec).
b. Speed droop does not exceed 5 per cent when the output load is increased from zero to maximum.

Further verify that the motor conforms to the requirements of NEMA MG-1.

4.6.2 Calibration fluid supply system.

4.6.2.1 Calibration system requirements. Demonstrate that the pump calibration fluid supply system meets the requirements of paragraph 3.4.2.1 utilizing SAE J967 (ISO 4113) fluid. Verify that the volume of calibration fluid in the reservoir can be determined without removal of the FITS panels.

4.6.2.2 Reservoir. Examine the reservoir to determine compliance with the requirements of paragraph 3.4.2.2.

4.6.2.3. Waste fluid reservoir. Examine the waste fluid reservoir to determine compliance with the requirements of paragraph 3.4.2.3.

4.6.2.4 Calibration fluid system temperature requirements. Demonstrate that the calibration fluid system has the capability of meeting the requirements of paragraph 3.4.2.4. Verify the use of non-ozone – depleting chiller refrigerant.

4.6.3 Lubrication oil system. Verify by demonstration and inspection that the lubrication oil system conforms to the requirements of paragraph 3.4.3.

4.6.4. Pump coupling device. Examine the coupling device visually, manually, and dimensionally to determine compliance with the requirements of paragraph 3.4.4.

4.6.5 Instrumentation system. Provide objective evidence that the instrumentation system satisfies the requirements of paragraph 3.4.5. Verify that the data display indicators are in conformance with paragraphs 3.4.5.1 through 3.4.5.9 and 3.4.5.11. and that the printer provides the data specified in paragraph 3.4.5.10.

4.6.6 Control system. Confirm that the control system contains a keyboard and modem as specified in paragraph 3.4.6. Verify that the control system conforms with the requirements of paragraphs 3.4.6.1 through 3.4.6.11. Further verify that all controls are located for ease of operator usage and are legibly marked for identification and function.

4.6.7 Interconnect system. Certify that the interconnect system meets the requirements of paragraph 3.4.7 and paragraphs 3.4.7.1 through 3.4.7.9.

4.6.8 Injector mounting rack. Examine the injector mounting rack visually, manually, and dimensionally to determine compliance with the requirements of paragraph 3.4.8. Verify that the rack can accommodate the injectors needed to test all pumps listed in paragraph 3.3.1.

4.6.9 DC voltage supply. Demonstrate that the DC voltage supply satisfies the requirements of paragraph 3.4.9. Confirm that the specified meter and electrical receptacle are provided.

4.6.10. Fluid measuring system. Verify that the fluid measuring system is of the positive displacement type and meets the accuracy requirements of paragraph 3.4.10.

4.6.11 Self diagnostic system. Certify that the FITS incorporates the self-diagnostic capabilities specified in paragraph 3.4.11.

4.6.12. Hour meter. Verify that a total time lapse hour meter is provided.

4.6.13 Bedplate. Examine the bedplate visually, manually, and dimensionally to confirm compliance with the requirements of paragraph 3.4.13.

4.6.14 Regulated air supply. Demonstrate that the FITS is capable of supplying filtered, compressed air regulated from 0 to 30 psi gage when connected to shop air.

4.6.15. Software for self training and fault diagnostics. Provide objective evidence that the software specified in paragraph 3.4.15 is provided.

4.7. Design and construction. Verify that the design and construction is in conformance with the requirements of paragraph 3.5.

4.7.1 Interchangeability. Provide objective evidence that all parts are manufactured to specific standards permitting replacement or adjustment without modification of the FITS or any of its parts.

4.7.2 Material. Verify that materials utilized conform to the requirements of paragraph 3.5.2. Further verify that when dissimilar metals are used in contact with each other, suitable protection against galvanic corrosion is applied.

4.7.2.1 Reclaimed materials. Verify that the use of reclaimed materials is in accordance with the requirements of paragraph 3.5.2.1.

4.7.3 Welding, brazing and soldering .Certify that welding, brazing and soldering operations are conducted only during fabrication of the original design but not for repair of defective parts.

4.7.4 Fastening devices. Examine all removable fastening devices on the FITS and verify that all use some means of keeping tightness and none are swaged, peened, staked, or otherwise permanently deformed.

4.7.5 Examine and inspect all surfaces of castings, forgings, molded parts, stampings, and welded parts to determine compliance with the requirements of paragraph 3.5.5.

4.7.6 Threads. Certify that all threads conform to ASME B1.1 for Unified Inch threads and B1.13M or B1.21M for Metric threads.

4.7.7. Gears. Confirm that all gears and pinions used in the FITS are in accordance with the requirements of AGMA 390.03 and AGMA 2000, or ISO 54. Verify that the gears are of the proper width, size and hardness to transmit full rated torque and horsepower throughout the speed ranges.

4.7.8. Lubrication Examine and inspect the FITS to determine that the test stand is provided with the means to comply with the requirements of paragraph 3.5.8.

4.7.9. Lubrication chart or plate. Locate the FITS lubrication chart or plate and verify that it is securely attached to the test stand. Confirm that the chart or plate is enclosed, sealed and provides the information in accordance with the requirements of paragraph 3.5.9.

4.7.10. Dials and instruments. Examine all dials to verify that they are permanently and legibly marked and have a non-glare finish on the surface visible to the operator. Examine all instruments to affirm that they are marked according to function. Verify that instrument faces are mounted or located in accordance with paragraph 3.5.10.

4.8. Painting. Verify that any necessary painting and finishing is in accordance with the requirements of paragraph 3.6.

4.9. Workmanship. Inspect the FITS to confirm compliance with the workmanship requirements of paragraph 3.7.

4.10 Nameplate. Locate the FITS nameplate and verify that it is corrosion resistant and permanently attached to the test stand. Confirm that lettering, numerals and informational items are in accordance with the requirements of paragraph 3.8.

4.11 Master accessories. Verify that each rebuilt test stand is furnished with containerized master accessories as specified in paragraph 3.9. Confirm that a list of contents with illustrated component location and any necessary assembly instructions are provided per paragraph 3.9.

4.12 Component marking. Confirm that each component is separately identified and keyed to an illustration. Verify that components are marked in accordance with the requirements of paragraph 3.9.1 a. through 3.9.1 e.

TABLE 1 REQUIREMENTS/VERIFICATION MATRIX

VERIFICATION METHOD
N- Not Applicable
1- Analysis
2- Demonstration
3- Examination
4- Test

VERIFICATION CLASS
A- First Article
B- Conformance

Section 3 Requirement	Verification Method					Verification Class		Section 4 Verification
	N	1	2	3	4	A	B	
3.2			X			X	X	4.4
3.3								4.5
3.3.1			X			X	X	4.5.1
3.3.2		X				X	X	4.5.2
3.3.3			X	X		X	X	4.5.3
3.3.3.1			X	X		X	X	4.5.3
3.3.3.2			X	X		X	X	4.5.3
3.3.3.3			X	X		X	X	4.5.3
3.3.3.4			X	X		X	X	4.5.3
3.3.4		X	X			X	X	4.5.4
3.4				X		X	X	4.6
3.4.1			X		X	X	X	4.6.1
3.4.2								4.6.2
3.4.2.1			X			X	X	4.6.2.1
3.4.2.2				X		X	X	4.6.2.2
3.4.2.3				X		X	X	4.6.2.3
3.4.2.4			X			X	X	4.6.2.4

Section 3 Requirement	Verification Method					Verification Class		Section 4 Verification
	N	1	2	3	4	A	B	
3.4.3			X	X		X	X	4.6.3
3.4.4				X		X	X	4.6.4
3.4.5		X	X	X		X	X	4.6.5
3.4.6			X	X		X	X	4.6.6
3.4.7		X	X	X		X	X	4.6.7
3.4.8			X	X		X	X	4.6.8
3.4.9			X	X		X	X	4.6.9
3.4.10			X			X	X	4.6.10
3.4.11			X	X		X	X	4.6.11
3.4.12				X		X	X	4.6.12
3.4.13				X		X	X	4.6.13
3.4.14			X			X	X	4.6.14
3.4.15		X	X			X	X	4.6.15
3.5		X	X	X		X	X	4.7
3.5.1		X	X			X	X	4.7.1
3.5.2			X	X		X	X	4.7.2
3.5.2.1		X	X			X	X	4.7.2.1
3.5.3			X			X	X	4.7.3
3.5.4				X		X	X	4.7.4
3.5.5				X		X	X	4.7.5
3.5.6		X				X	X	4.7.6
3.5.7		X	X	X		X	X	4.7.7
3.5.8				X		X	X	4.7.8
3.5.9				X		X	X	4.7.9
3.5.10				X		X	X	4.7.10
3.6				X		X	X	4.8
3.7				X		X	X	4.9
3.8				X		X	X	4.10
3.9				X		X	X	4.11
3.9.1				X		X	X	4.12

5. PACKAGING.

5.1 Preservation, Packing, And Packaging. Preservation, Packing and Packaging shall be in accordance with ASTM-D-3951 plus the following additional requirements. The unit package quantity shall be 1 fuel injection pump test stand each.

5.2 Additional Requirements.

5.2.1 Interior Systems. Flush and drain the entire calibrating fluid system of the test stand and nozzle tester with SAE J967 calibrating fluid or its equivalent. Flush and drain the cooling system with a mixture that is 50 percent water and 50 percent automotive ethylene glycol

antifreeze, which contains a corrosion inhibitor. Any system drained shall have all drain holes sealed. Any fluid system shipped filled shall be protected against leakage of fluids during shipment and storage.

5.2.2 Drive belts. Drive belts shall be relieved from tension, if required, to prevent stretching of the belt in storage.

5.2.3 Refrigerant compressor crankcase. The refrigerant compressor crankcase shall be filled to the proper level with the oil required for operation. The compressor shall be operated to ensure complete coverage of all working parts. The oil shall be left in the crankcase and a waterproof tag shall be attached stating "CRANKCASE FILLED WITH OIL REQUIRED FOR OPERATION". All openings to the interior of the compressor shall be sealed.

5.2.4 Enclosed gears and chains. If applicable to the unit, enclosed gears and chains shall have the housing filled to the operating level with the approved lubricant required by the lubrication order for operation, and shall be tagged to indicate that the housing is filled with the required operating oil. All openings shall be sealed.

5.2.5 Evaporators and condensers. Appropriate measures shall be taken to assure that evaporators and condensers are clean, dry and preserved in such a manner to prevent corrosion from forming during shipment and long term storage.

5.2.6 Pipe and tubing. The ends of open pipes and tubing shall be sealed.

5.2.7 Air filters. Filters installed in their operating position are acceptable as is. All other air filters shall be individually boxed.

5.2.8 Test stand, chiller, and console. The unit protection for these items shall be to cover all apertures. Cover all gage crystals, the entire control panel, computer monitor, corners and all projections with thick uncompressed cushioning material and secure the cushioning material in place. Wrap all preserved metal surfaces with non-dusting, non-corrosive barrier material and secure in place.

5.2.9 Accessories and adapter kits. All standard and master accessories and adapter kits shall be preserved like the basic machine and placed in their respective pockets in the metal containers provided. Any gages or instruments not provided space shall be cushioned and placed in a waterproof, greaseproof box.

5.3 Packing.

5.3.1 Test Stand, flow console and chiller. Each individually packaged test stand, flow console and chiller shall be packed in crates, with an inspection door positioned to coincide with the inspection window in the barrier bag. The units will be anchored, blocked, braced and cushioned to prevent any damage to the units.

5.3.2 Mechanical handling requirements. The completed unit packs, shipping container(s) and all contents shall be capable of withstanding the handling conditions expected from forklift handling.

5.4 General.

5.4.1 If oak or chestnut wood products are used in the performance of this contract, these wood or wood products must be free of all bark.

5.4.2 Unless otherwise specified herein, shipments to the same destination of identical items having a total packaged displacement exceeding 50 cubic feet shall be palletized unless forklift - handling features such as skids are included on containers.

5.4.3 Workmanship shall be such that when proper procedure is followed, materials and equipment being processed will be provided the maximum protection against corrosion, deterioration, and be suitable for storage to the level of packaging specified.

5.5 Marking Requirements.

5.5.1 Container markings shall be in capital letters of equal height, shall be proportionate to the available marking space and shall contain the following information in the order listed:

a. NSN/NATO stock number (NSN shall be the no. of the rebuilt stand 4910-01-465-4537).
b. CAGE code of the company awarded the contract, and the contractor's part number assigned to the rebuilt item.
c. Quantity and unit of issue.
d. Level of protection and date packed.
e. Contract or purchase order number.

5.5.2 Markings on the shipping container shall be grouped into three distinct categories, identification markings, contract data markings and address markings.

5.5.3 Identification Markings:

a. NSN/NATO stock number (NSN shall be the no. of the rebuilt stand 4910-01-465-4537).
b. CAGE code of the company awarded the contract, and part number of the item as specified in the contract.
c. Quantity and unit of issue.
d. Level of protection and date packed.
e. Gross weight and cube.
f. Item description or nomenclature.

5.5.4 Contract Data Marking:

The contract data marking placed under the identification markings, shall consist of the contract or purchase order number.

5.5.5 Address Markings:

The address markings placed to the right of the identification and contract data markings (if space is available) shall consist of the following information in the order shown.

a. Control number or reference number (as a minimum, the Transportation Control Number (TCN)
Shall be provided as the single standard shipment identification number)

b. FROM MILITARY: Name and address of consignor (DOD Activity Address Code) and in the clear address if applicable.

c. FROM CONTRACTOR: Name and address of the contractor (including nine-digit zip code).
When supplies are shipped from a subcontractor, only the name and address of the company awarded the contract shall be used.

d. TO: Name and address of consignee DOD Activity Address Code (DODAAC) and in the clear
Address if applicable.

e. Piece number and total pieces (if more than one shipping container is used for the order).

5.6 In addition to the above information, the NSN/NATO stock number shall be bar coded on the unit packs and intermediate containers. The following shall be bar coded on the shipping container. All bar coding shall use the 3 of 9 format in accordance with ANSI MH10.8M.

NSN/NATO stock number.
Contract or order number.
CAGE code of the company awarded the contract.
Contract Line Item Number (CLIN) if applicable.

6. NOTES
(This section contains information of a general or explanatory nature, which may be helpful, but is not mandatory.)

6.1 Intended use. The FITS will be used to test and recalibrate specific Fuel Injection Pumps that are a component in Diesel Engines used in all types of Army vehicles.

6.2 Definitions.

6.2.1 The term Fuel Injection Pump Test Stand or FITS, as used in this DFP, shall mean the rebuilt and redesigned Bacharach Model 8020, as specified herein.

6.3 Government-furnished property. Government-furnished property is required as stated in paragraph 3.2

6.4 Government-loaned property. Government-loaned property is required as stated in paragraph 3.2

PART 1 SECTION D

PACKAGING

NSN: 4910-01-465-4537
NOMEN: Fuel Injection Test Stand
PRON: DFP 390

Packaging for the FUEL INJECTION PUMP TEST STAND:
In accordance with Section 5 of Battlefield Maintenance Systems Engineering Team Description for Purchase (DFP) number 390 dated 12 June 00. Copy completely enclosed in this solicitation.