DEPARTMENT
OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT

AND GENERAL SUPPORT MAINTENANCE

MANUAL INCLUDING REPAIR PART LIST

FOR

TEST SET, INJECTOR

(BACHARACH INSTRUMENT COMPANY)
(4910-00-355-6248)
MODEL YHQ

HEADQUARTERS,
DEPARTMENT OF THE ARMY

MARCH 1978

WARNING

The force of the spray from a fuel injection nozzle is sufficiently great to penetrate the skin. Fuel oil in the blood stream can cause blood poisoning. Keep hands away from injectors and nozzles when they are being tested.

REPORTING OF ERRORS

You can help improve this manual by calling attention to errors and by recommending improvements and by stating your reasons for the recommendations. Your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) should be mailed directly to Commander, US Army Armament Materiel Readiness Command, ATTN: DRSAR-MAS, Rock Island, IL 61299. A reply will be furnished directly to you. For your convenience, preaddressed DA Form 2028's are included as final pages of this manual.

Operator, Organizational, Direct Support and General Support Maintenance Manual Including Repair Parts List for:

Test Set, Injector, Model YHQ
4910-00-355-6248

NOTE

This manual is published for the purpose of identifying an authorized commercial manual for the use of the personnel to whom the test set is issued. Repair parts should be ordered by manufacturer's part number as shown in the back of this manual. Model and serial number should be referenced when ordering replacement parts.

Manufactured by: Bacharach Instrument Co.
625 Alpha Drive
R1DC Industrial Park
Pittsburg, PA 15238

Procured under Contract No: DAAA09-75-C-6876

GENERAL

Model YHQ Nozzle Test Fixture, used in conjunction with Model YFL Nozzle Tester and Connector Combination 65-881, is designed to test all General Motors Series 53, 71 and 110 unit injectors by applying factory recommended tests to determine injector condition. Test Fixture is available with two interchangeable Seat Blocks. One Seat Block will test Series 53 and 71 standard and offset body injectors. The other Seat Block is used to test Series 110 standard and offset injectors. Use of these Seat Blocks is discussed in the titled section below.

Connector Combination 65-881 includes a Connector Tube, Nuts and Adapter for testing the spray tip and check valve assembly of the Series 71 needle valve unit injector while it is connected to the Model YFL Nozzle Tester. This test requires that the Nozzle Tester be equipped with a 5000 psi gauge as shown in Fig. 5. Servicing injectors requires specialized equipment, facilities and trained personnel. In all instances, actual test and repair procedures which have been established by the engine builder should be closely followed. Refer to the engine manual for specific performance figures and injector disassembly and assembly instructions.

Figures 5 and 6 identify parts of the Nozzle Test Fixture and Connector Combination referred to in these instructions. Operation and maintenance of the YFL Nozzle Tester is covered in a separate pamphlet, 8-I-54. Nozzle Tester is shown mounted on Test Fixture, but if Fixture and Nozzle Tester were purchased separately, mount Tester on Base Plate (1) using three 3/8" - 16 x 5/8" lg. cap screws.

Nozzle Test Fixture can be permanently mounted to bench or table top with 3/8" bolts through holes in the Base Plate, or it may be used as a portable tool by fastening it to bench or table with C-clamps or similar fasteners.

INSTALLING SEAT BLOCKS

Series 53, 71 and 110 injectors, both offset and standard body, are positioned in the Test Fixture by means of Seat Blocks. Seat Block (2) is used when testing Series 53 and 71 injectors; Seat Block (3) is used with Series 110 injectors.

The photographs and drawings (Figs. 1 through 4) illustrate the position of the Seat Block on the frame of the Test Fixture. The Seat Block must be located in the proper holes so the filter caps of the injector will align and seal properly with the Sockets (4) when the injector is installed in the Test Fixture. Slots in the Seat Blocks receive the injector dowel pin and guide the injector into the Test Fixture.

With the standard body 110 injector pull out the Shift Knob (5), away from the Test Fixture, to change the spacing between the Sockets (4) to accommodate the filter caps. All other injectors are tested with the Shift Knob pushed in toward the Test Fixture Frame.

When the injector is properly positioned in the Test Fixture the leaf spring on the Seat Block will automatically position the injector fuel rack in the full fuel position.

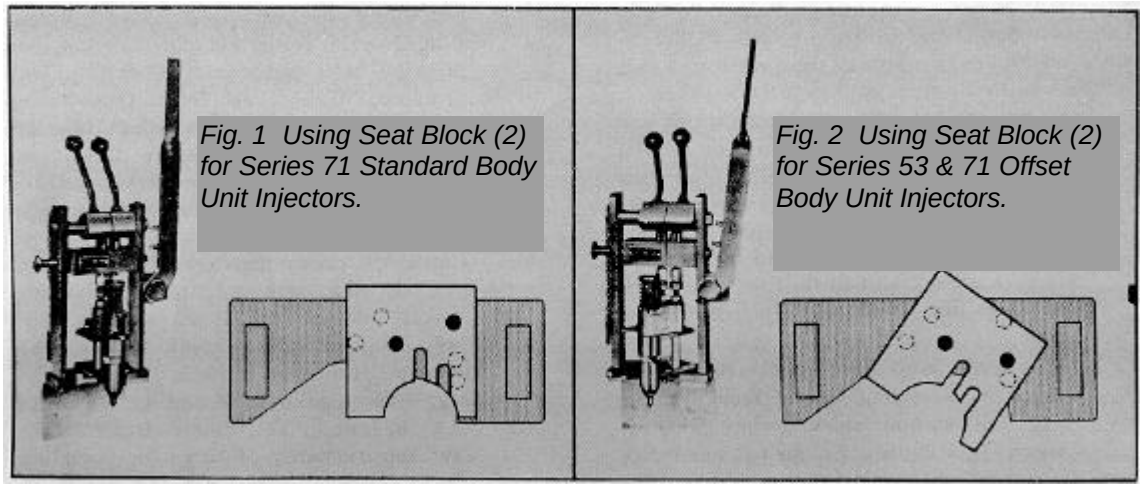


Fig. 1 Using Seat Block (2) for Series 71 Standard Body Unit Injectors.

Fig. 2 Using Seat Block (2) for Series 53 & 71 Offset Body Unit Injectors.

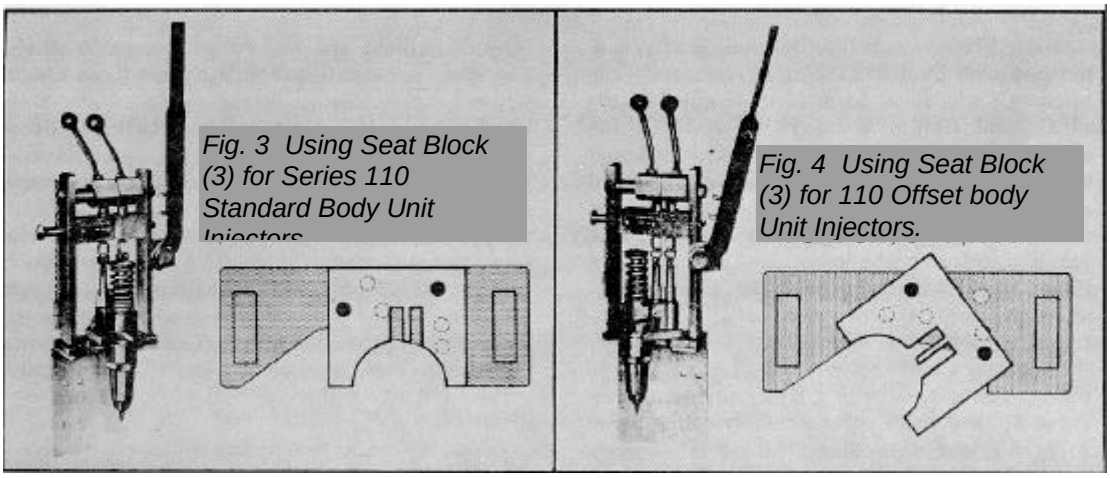


Fig. 3 Using Seat Block (3) for Series 110 Standard Body Unit Injectors

Fig. 4 Using Seat Block (3) for 110 Offset body Unit Injectors.

PREPARING FOR TEST

1. Ready the Nozzle Tester (6) for use by filling the Fuel Reservoir (7) with clean fuel oil or recommended test fluid.
2. Nozzle Tester is self priming; several strokes may be necessary to evacuate entrapped air. Although it is not necessary, the Priming Screw in the side of the Nozzle Tester Body and directly behind the lower discharge fitting can be opened for thorough venting as a priming aid.
3. Install Seat Block in proper holes of Test Fixture for injector under test as illustrated in Figs. I through 4.
4. Install injector by sliding in place and engaging dowel on under side of body in proper slot in Seat Block. Check that fuel rack is against leaf spring of Seat Block.
5. Connect injector to Fuel Line (8) by rotating Inlet Cam Handle (9) toward Nozzle Tester to move Socket (4) against injector inlet filter cap.
6. Purge injector of air by operating Nozzle Tester until clear fuel flows from outlet filter cap. Then rotate Outlet Cam Handle (10) toward Nozzle Tester to seal outlet filter cap. Operate Nozzle Tester to build up slight pressure in test system and pop injector two or three times with Popping Handle (11).

INJECTOR TESTS

This outline of tests for injectors is principally to guide the user in properly operating the Test Fixture to perform recommended tests. For specific procedures, pressures and results of observations refer to engine manual since variation exists between different types and models of injectors.

1. Check injector rack and plunger movement for freedom of travel. Move Spring on Seat Block out of position to allow full rack travel. Put rack in no fuel position; depress Popping Handle (1) to bottom of stroke. Slowly release Popping Handle while moving rack back and forth. Friction of rack indicates dirty or damaged internal injector parts.
2. Determine valve opening pressure of injector by operating Nozzle Tester Handle with full, smooth strokes; simultaneously watch Test Fixture Gauge (12) and note pressure when injector sprays fuel. The opening or pop pressure should be 450 to 850 psi.
3. Determine valve holding pressure by operating Nozzle Tester Handle to bring the pressure to a point just below popping pressure. Quickly close Nozzle Tester Valve (13) and note pressure at which valve is closed and time the pressure drop over specified interval. Time for pressure drop from 450 to 250 psi should not be less than 40 seconds.
4. Check for leaks at high pressure at injector nut seal ring, rack hole, plugs, filter cap gaskets and internal lapped surfaces. Depress plunger with Popping Handle (11) far enough to cover ports in plunger bushing; lock handle by inserting Lock Pin (14) in hole in Test Fixture frame. Maintain approximately 1600 psi by operating Tester Handle while checking for leaks.

5. Observe spray pattern using Tester Handle to raise pressure to just below opening pressure and pop injector several times with Popping Handle. Check for clogged orifices and uniform spray pattern.

Before removing injector from Test Fixture, pop with Popping Handle until no pressure is observed on Gauge (12) to avoid fuel spray as Sockets (4) are disconnected from injector.

After injectors pass above tests they should be flow tested and matched into sets on a YZR or YQT Injector Comparator.

ADDITIONAL TESTS FOR NEEDLE VALVE INJECTORS

In addition to the tests for rack and plunger freedom, holding pressure, and spray pattern as outlined in crown valve injector tests; needle valve injectors are also tested for opening and holding pressure of the needle valve.

After the above tests are completed disconnect the Fuel Line (8) at the Nozzle Tester. Install Connector Tube N-1 (15) to the discharge block of the Nozzle Tester with Nut N4 (16). The Nuts are tapped with both left and right hand threads. The end of the nut with the circular shoulder has the left hand thread and is always connected to the Tube. Engage one or two threads of Nut on Tube then tighten Nut to discharge block.

Hold Adapter N47 (17) in vise at hex and assemble check valve, valve cage, spring and seat, spring cage, needle valve and tip on lapped surface of Adapter. Place injector nut over spray tip and thread it to Adapter using 75-85 ft. lb. of torque. Connect Adapter with injector parts to Connector Tube using Nut N-4 as shown in Fig. 5. Operate Tester Handle until assembly is purged of air and needle valve has opened several times.

1. Observe opening pressure of needle valve (2000 to 3200 psi) while operating Tester Handle with full smooth strokes. Valve opening and closing should be sharply defined.
2. Establish valve holding time by operating Tester Handle to bring Gauge (18) pressure to 2000 psi and quickly close Valve (13). Time for pressure drop from 2000 psi to 1500 psi should not be less than 20 seconds with no drops of fuel collecting at spray tip.

Open Valve and allow pressure to bleed off before removing Adapter from Connector Tube.

After injectors pass above tests they should be flow tested and matched into sets on a YZR or YQT Injector Comparator.

MAINTENANCE INFORMATION

Replacement parts for Fixture are available should they become necessary due to normal wear or other reasons. Ordinarily, stand needs no maintenance. If leakage should develop, it is suggested that a dummy injector or test block, Code 65-252 be used to locate and repair leak.

Test block is connected in system at Socket (4) on Test Fixture in same manner as unit injector.

Using Nozzle Tester, build up system pressure to 1500 psi. Close Pump Valve; leakage should be less than 60 psi per fifty seconds from 1500 psi. If Gauge indicates leakage in excess of this, locate as follows

1. With clean, compressed air, blow dry all joints where leakage may occur and inspect for seepage. Lacking compressed air, use clean cloth or tissue paper.
2. If seepage appears at Sockets, turn Cam Handle to be certain that trouble is not due to insufficient force between Socket and test block.
3. Make certain Pump Valve is tightly closed.
4. Leakage other than that of 2 and 3 is corrected by tightening connections, replacing defective parts or similar repair procedures.

Some care should be used when installing injectors; align injector filter caps with Socket (4). Misalignment may cause Sockets to permanently damage seals to such an extent that seals need to be replaced. Extra seals are supplied with Test Fixture and are installed by unscrewing Socket Cap (19), removing old seal and installing new one. When this is done, new seals should be ordered from factory.

Nozzle Tester can also be used to test nozzles of hydraulically- operated, differential- pressure type. To do this, optional gauges of required ranges are available. On stands so equipped, these nozzles are tested by disconnecting Fuel Line (8) at Nozzle Tester and attaching nozzle as indicated in instruction bulletin on Nozzle Tester. Keep Cap Nut (20) tightly screwed on discharge outlet not in use.

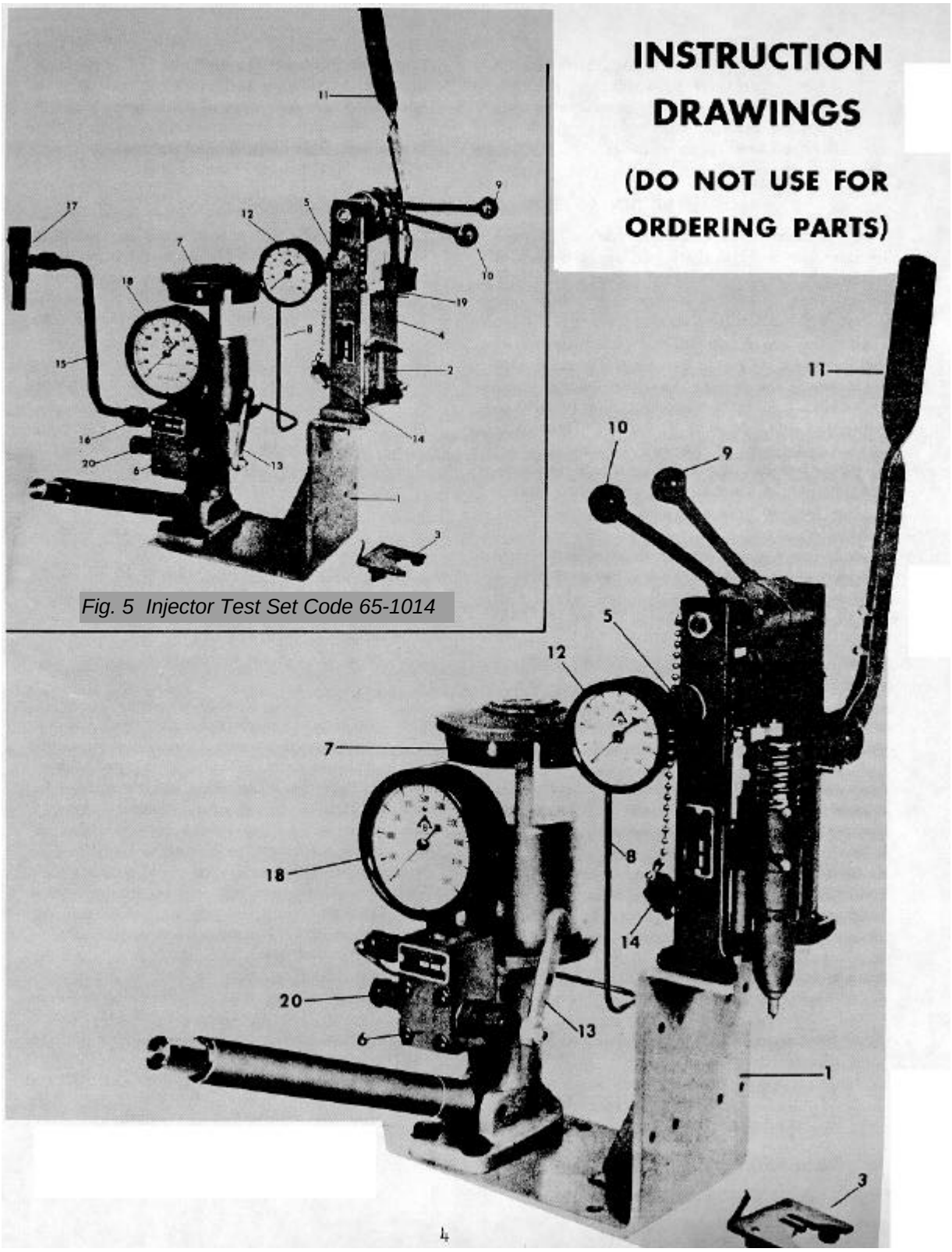
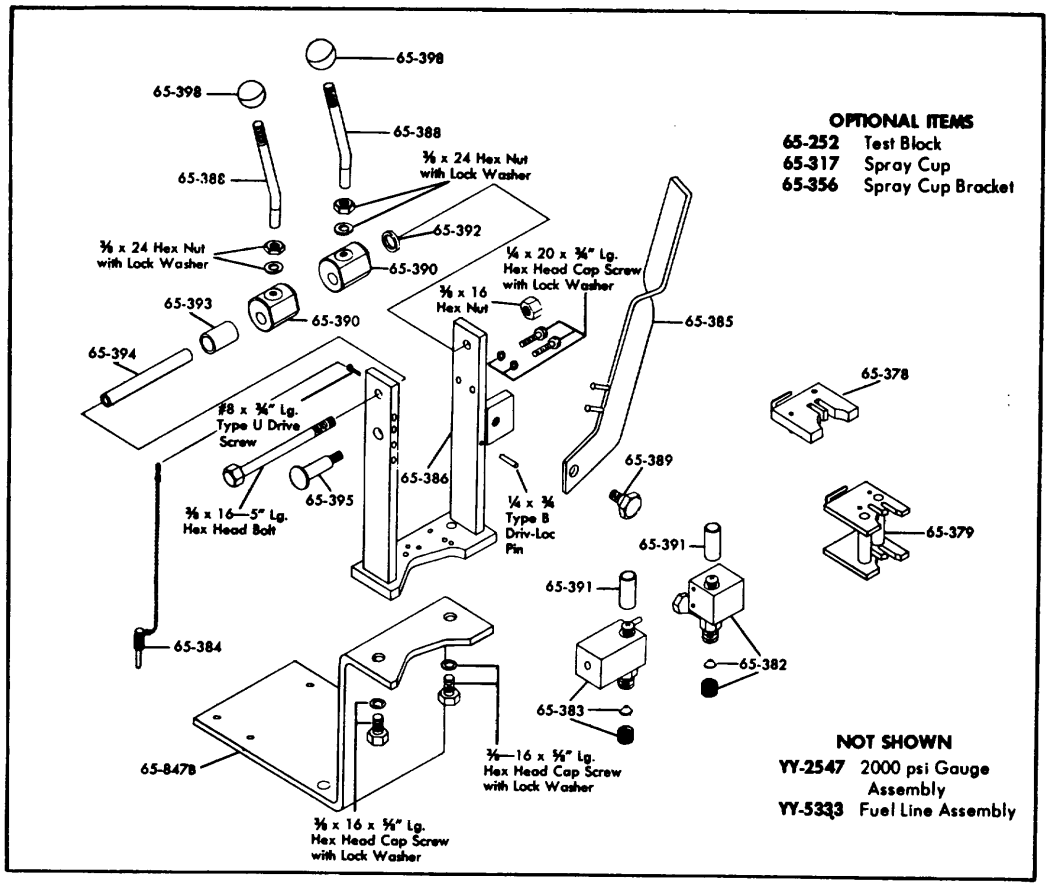


Fig. 6. Model YFL Nozzle tester mounted on Test Fixture with Series 71 Offset Body Unit Injector installed

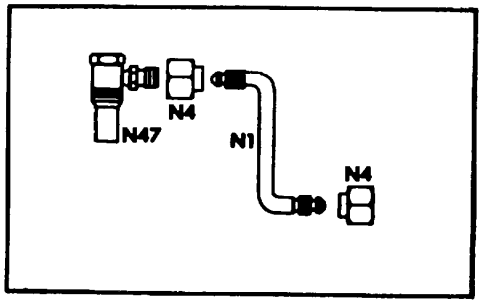


PARTS UST for
TEST FIXTURE - Code 65-928B

Code No.	Description
65-378	Seat Block for Series 110 Injectors
65-379	Seat Block for Series 53 & 71 Injectors
65-382	Injector Inlet Connector Block
65-383	Injector Outlet Connector Block
65-384	Detent Pin and Chain Assembly
65-385	Injector Popping Handle
65-386	Frame Assembly
65-388	Cam Handle Arm
65-389	Popping Handle Stud
65-390	Eccentric Cam
65-391	Cam Follower
65-392	Spacer
65-393	Spacer
65-394	Spacer
65-395	Connector Block Shift Knob
65-398	Cam Handle Knob
65-847b	Z-shaped Base Plate

See Instructions 8154 and PARTS LIST #31 for

PARTS LIST for CONNECTOR COMBINATION - Code 65-881



Code No.	Description
65-276	Connector Tube N-1
65-279	Connector Nut N4
65-498	Adopter N-47

NOZZLE TESTER Model YFL

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

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Brigadier General, United States Army
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