Instruction Leaflet
41-759.2D

Effective: May 1999
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( | ) Denotes Change Since Previous Issue

# Type ARS Auxiliary Relay
## High Speed

**CAUTION**

**Before putting protective relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment. Make sure that all moving parts operate freely. Inspect the contacts to see that they are clean and can close properly. Operate the relay to check the settings and electrical connections.**

## 1.0 APPLICATION

The ARS relay is a high speed auxiliary that has a 20 volt low energy level input and a multiple contact output. It may be used as a tripping auxiliary for relays such as the SP and SDG-1 or as an oscillograph interface.

The driving device must be capable of providing an input to the ARS of 6 milliamperes at a level of 15 to 20 volts.

## 2.0 CONSTRUCTION AND OPERATION

The type ARS relay is composed of 1 or 2 AR units with series resistors, a printed circuit module, and indicating contactor switches (ICS) when required, mounted in a FT-11 or FT-22 case, depending upon style.

### AR Unit

The relay consists of four stationary contact screws, four leaf spring moving contacts, a moving armature and card assembly, which operates the moving contacts; a U shaped laminated core, a coil, a frame, a molded insulation block and a series resistor.

The armature and card assembly slip over a hinge pin which is inserted in the laminations. The moving and stationary contacts are mounted on the molded insulation block. The molded block and coil and lamination assembly are mounted to the frame. All contacts are fine silver.

When the coil and resistor are energized, the armature is attracted to the laminations. The card moves with the armature thereby operating the moving contacts. The tension of the moving contacts is the resetting force.

High speed operation is obtained by the low inertia of the moving parts, a sensitive electromagnet, and the proper L/R ratio of the operating circuit.

### Printed Circuit Module

The printed circuit module contains the proper number of transistors, protective zener diodes, capacitors, resistors, and diodes for the buffered amplifier circuitry controlling each AR unit. With the rated supply voltage to the relay, the proper signal voltage applied to an input terminal will cause the related AR unit to pickup. The AR unit will then energize the ICS (if used), which will seal around the AR unit contacts.

The removal of the input voltage will cause the AR unit to drop out.

### Indicating Contactor Switch Unit (ICS)

The dc indicating contactor switch is a small clapper

type device. A magnetic armature, to which leaf-spring mounted contacts are attached, is attracted to the magnetic core upon energization of the switch. When the switch closes, the moving contacts bridge two stationary contacts, completing the trip circuit. Also during this operation two fingers on the armature deflect a spring located on the front of the switch, which allows the operation indicator target to drop. The target is reset from the outside of the case by a push-rod located at the bottom of the case.

The front spring, in addition to holding the target, provides restraint for the armature and thus controls the pickup value of the switch.

The ICS is commonly used to provide a seal in around the main protective relay contacts relieving them of carrying heavy duty trip currents. When ac current is necessary in a control trip circuit, some chattering can be observed and the ICS unit can be replaced by and ACS unit.

## 3.0 CHARACTERISTICS

All ARS relays are capable of being energized continuously. The energy requirements are listed in Table 1.

**Table 1:**
**Input Energy Requirements**

**Per Input**

| INPUT (dc Volts) | INPUT VOLTAGE RANGE (dc Volts) | MAXIMUM INPUT CURRENT REQUIREMENT |
|---|---|---|
| 20 | 15 to 20 | 6 milliamperes |

**Drain Per AR Unit**

| dc Volts | Non-Operate | Operate |
|---|---|---|
| 48 | 0 | 83 milliamperes |
| 125 | 0 | 210 milliamperes |

### AR Unit

All AR units are capable of being energized continuously. All high speed relays will pick up at 80% of rated voltage or less; and drop out at 5% of rated voltage or higher.

Typical operating times and effective contact bounce are outlined in Tables 2 and 4.

Each relay contact is rated 3 amps continuous and 30 amps long enough to trip a breaker.

### Indicating Contactor Switch (ICS)

The main contacts will close 30 amperes at 250 Vdc and the seal-in contacts of the indicating contactor switch (ICS) will carry this current long enough to trip a circuit breaker.

The indicating contactor switch (ICS) has two taps that provide a pickup setting of 0.2 or 2 amperes. To change taps requires connecting the lead located in front of the tap block to the desired setting by means of a screw connection. Operating speed of the ICS unit at two times pickup is 10 to 16 ms.

| Trip Circuit Constants Indicating Contactor Switch | |
|---|---|
| 0.2 A tap | 6.5 ohms dc resistance |
| 2.0 A tap | 0.15 ohms dc resistance |

### ARS Operate and Reset Time

The operate and reset times for the ARS relay are shown in Tables 2 and 3. The ARS operating time is the combined time of the circuit delay time (Table 3) plus the AR unit time (Table 2) according to the particular contact arrangement used.

**Table 2:**
**AR Unit Operate and Reset Times**

| Rated Operating Energy (Watts) | Operate Time (Milliseconds) | | Reset Time (Milliseconds) |
|---|---|---|---|
| | NO Contact Closes | NC Contact Opens | NC Contact Closes |
| 10 | 2.0 | 1.5 | 4.0 |

**Table 3:**
**Maximum Circuit Delay Time**

| Input (dc volts) | Voltage Applied | Delay Time in Milliseconds |
|---|---|---|
| 20 | 15 volts | .090 |

**Table 4:**
**AR Unit Contact Bounce**

| Contact Loading | Effective Bounce Time in Milliseconds | |
|---|---|---|
| | Normally Open | Normally Open |
| Dry Circuit | 2 | 6-8 |
| 10 Watt (one AR relay) | 1 | -- |
| Breaker Trip Coil | 0.2 | -- |

**Table 5:**
**Contact Interrupting Capability (Amperes)**

| dc Voltage | Resistive Load | Inductive Load |
|---|---|---|
| | Will Interrupt | Will Interrupt |
| 250 | 0.2 | 0.1 |
| 125 | 0.5 | 0.25 |
| 48 | 1.5 | 1.0 |

## 4.0 SETTINGS

No setting is required on the ICS unit except the selection of the 0.2 to 2.0 ampere tap setting. This selection is made by connecting the lead located in front of the tap block to the desired setting by means of the connecting screw.

## 5.0 INSTALLATION

The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration, and heat. Mount the relay vertically by means of the four mounting holes on the flange for semi-flush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed information on the FT-11 or FT-22 case, refer to I.L. 41-076.

## 6.0 ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory and should not require readjustment after receipt by the customer. If the adjustments have been changed or the relay taken apart for repairs, the instructions below should be followed.

### 6.1 Acceptance Check

**AR Unit**

The following check is recommended to insure that the AR unit is in proper working order.

1. Contact gaps
   a. Normally open contacts should have a gap 0.018 to 0.023 inch.
   b. Normally closed contact gap should be .013 minimum.

2. Contact pressure
   a. On four normally open contact relays, the normally open contacts should have approximately 4 grams pressure on the card in the de-energized position, and 15 to 30 grams contact pressure in the energized position.
   b. On two normally open and two normally closed relays, the normally closed contacts should have approximately 15 grams contact pressure in the de-energized position. Each normally open contact spring should have approximately 8 grams pressure against the card.

*NOTE: For this check to be made accurately, it is necessary to back out the NC stationary contact screw. This will disturb the factory calibration and therefore it is recommended this check not be made on a relay which passes all other checks.*

3. Armature gap

   The armature gap should be 0.009 inches measured at the narrowest part of the armature gap.

4. Contact operate time

   Per Table 2, page 2,

**Indicating Contactor Switch (ICS)**

Close the main relay contacts and pass sufficient dc current through the trip circuit to close the contacts of the ICS. The operation indicator target should drop freely.

For proper contact adjustment, insert a 0.030" feeler gauge between the core pin and the armature. Hold the armature closed against the core pin and gauge. Adjust the stationary contacts such that they just make with the moving contact. Both stationary contacts should make at approximately the same time. The contact follow will be approximately 3/64" to 5/64".

**Printed Circuit Module**

The following check is recommended to insure that the circuitry on the printed circuit module is functioning properly.

1. **Apply 15 to 20 volts to** the proper supply terminals, marked positive and negative on internal schematics.

2. Apply rated voltage to each input, one at a time, and its respective AR unit should operate (pick-up). Remove the input and the AR unit should drop out. The ARS relay should operate within the times shown in Table 2 and 3. The ARS operating time is the combined time of the circuit delay time (Table 3, page 3) plus the AR unit time (Table 2, page 2) according to the particular contact arrangement used.

## 7.0 CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs or the adjustments disturbed. This procedure should not be used until it is apparent that the relay is not in proper working order. (See "Acceptance Check" page 3).

**Tripping Relay (AR Unit)**

If the type AR tripping relay unit adjustments are disturbed or are in error, or it becomes necessary to replace some part, use the following adjustment procedure.

a. Adjust the set screw at the rear of the top of the frame to obtain a 0.009-inch gap at the rear end of the armature air gap.

b. On four normally open contact relays adjust each contact spring to obtain 4 grams pressure at the very end of the spring. This pressure should be sufficient to move the spring away from the edge of the slot of the card.

   On the two normally open two normally closed contact relay, adjust each normally open contact spring for 8 grams to just move the contact away from the card. Adjust the normally closed contact for 15 grams spring pressure, to just move contact spring away from the card. Then adjust the stationary contact screw to just move the contact spring away from the card.

c. Adjust each stationary contact screw to obtain a contact gap of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact pressure. The normally closed, if any, should have a contact gap of .015 inches.

When calibrated as outlined above, the relay should meet the characteristics of Table 2, page 2 and Table 4, page 3.

**Indicating Contactor Switch (ICS)**

Close the main relay contacts and pass sufficient dc current through the trip circuit to close the contacts of the ICS. The operation indicator target should drop freely.

**Printed Circuit Module**

No calibration required other than check listed under acceptance check.

## 8.0 RENEWAL PARTS

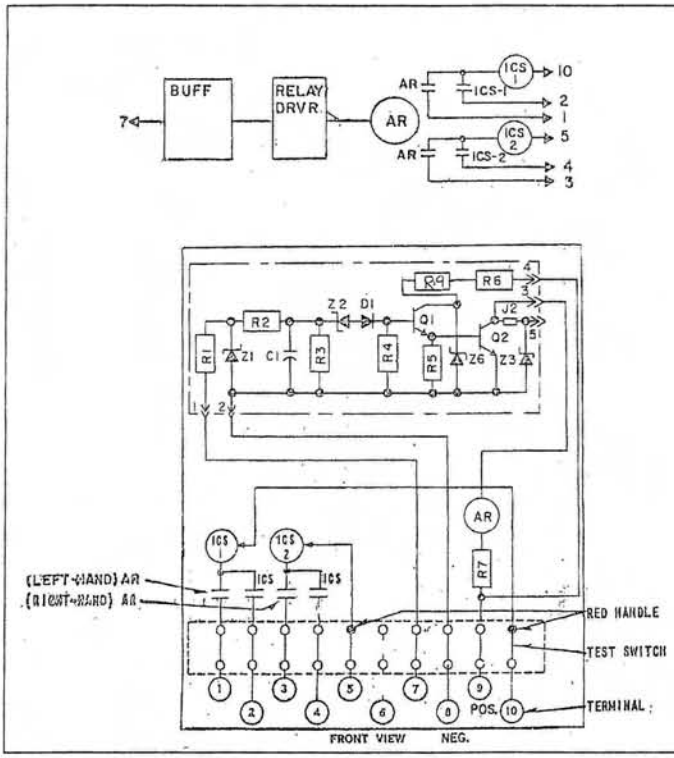
Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

| Relay Style Number | Description | Number Of Units | | Internal Schematic | Circuit Board Style Number | Circuit Board Component Location |
|---|---|---|---|---|---|---|
| | | ICS | AR | | | |
| **FT-11 Case (Fig. 27)** | | | | | | |
| 718B820A09 | 48 Vdc; 2M contacts | 2 | 1 | 719B963 (Fig. 1) | 204C674G01 | 880A436 (Fig. 5) |
| 718B820A10 | 125 Vdc; 2M contacts | 2 | 1 | 719B963 (Fig. 1) | 204C674G02 | 880A435 (Fig. 6) |
| 718B820A11 | 250 Vdc; 2M contacts | 2 | 1 | 719B944 (Fig. 2) | 204C818G01 | 880A433 (Fig. 7) |
| 718B820A12 | 48 Vdc; 2M contacts | 1 | 1 | 719B945 (Fig. 3) | 204C674G01 | 880A436 (Fig. 5) |
| 718B820A13 | 125 Vdc; 2M contacts | 1 | 1 | 719B945 (Fig. 3) | 204C674G02 | 880A435 (Fig. 6) |
| 718B820A14 | 250 Vdc; 2M contacts | 1 | 1 | 719B946 (Fig. 5) | 204C818G01 | 880A433 (Fig. 7) |
| **FT-22 Case (Fig. 28)** | | | | | | |
| 717B770A10 | 48 Vdc; 2M-2B contacts | 0 | 1 | 719B951 (Fig. 8) | 204C761G02 | 880A962 (Fig. 13) |
| 717B770A11 | 125 Vdc; 2M-2B contacts | 0 | 1 | 719B951 (Fig. 8) | 204C761G01 | 880A434 (Fig. 14) |
| 717B770A12 | 48 Vdc; 4M contacts | 0 | 1 | 719B952 (Fig. 9) | 204C761G02 | 880A962 (Fig. 13) |
| 717B770A13 | 125 Vdc; 4M contacts | 0 | 1 | 719B952 (Fig. 9) | 204C761G01 | 880A434 (Fig. 14) |
| 717B770A14 | 48 Vdc; 2M-2B contacts | 2 | 1 | 719B947 (Fig. 10) | 204C761G02 | 880A962 (Fig. 13) |
| 717B770A15 | 125 Vdc; 2M-2B contacts | 2 | 1 | 719B947 (Fig. 10) | 204C761G01 | 880A434 (Fig. 14) |
| 717B770A16 | 250 Vdc; 2M-2B contacts | 2 | 1 | 719B948 (Fig. 11) | 204C762G01 | 880A431 (Fig. 15) |
| 717B770A17 | 48 Vdc; 4M contacts | 2 | 1 | 719B956 (Fig. 12) | 204C761G02 | 880A962 (Fig. 13) |
| 717B770A18 | 125 Vdc; 4M contacts | 2 | 1 | 719B956 (Fig. 12) | 204C761G01 | 880A434 (Fig. 14) |
| 717B770A19 | 48 Vdc; 4M-4M-4M contacts | 0 | 2 | 719B953 (Fig. 16) | 204C675G02 | 880A965 (Fig. 23) |
| 717B770A20 | 125 Vdc; 4M-4M contacts | 0 | 2 | 719B953 (Fig. 16) | 204C675G01 | 880A964 (Fig. 24) |
| 717B770A21 | 48 Vdc; 4M-2M/2B contacts | 0 | 2 | 719B950 (Fig. 17) | 204C675G02 | 880A965 (Fig. 23) |
| 717B770A22 | 125 Vdc; 4M-2M/2B contacts | 0 | 2 | 719B950 (Fig. 17) | 204C675G01 | 880A964 (Fig. 24) |
| 717B770A23 | 48 Vdc; 2M/2B-2M/2B contacts | 0 | 2 | 719B949 (Fig. 18) | 204C675G02 | 880A965 (Fig. 23) |
| 717B770A24 | 125 Vdc; 2M/2B-2M/2B contacts | 0 | 2 | 719B949 (Fig. 18) | 204C675G01 | 880A964 (Fig. 24) |
| 717B770A25 | 48 Vdc; 4M-4M contacts | 2 | 2 | 719B954 (Fig. 19) | 204C675G02 | 880A965 (Fig. 23) |
| 717B770A26 | 125Vdc; 4M-4M contacts | 2 | 2 | 719B954 (Fig. 19) | 204C675G01 | 880A964 (Fig. 24) |
| 717B770A27 | 250 Vdc; 4M-4M contacts | 2 | 2 | 719B955 (Fig. 20) | 204C763G01 | 880A963 (Fig. 25) |
| 717B770A28 | 125 Vdc; 2M-2B/2M-2B contacts | 2 | 2 | 719B957 (Fig. 21) | 204C675G01 | 880A964 (Fig. 24) |
| 717B770A29 | 250 Vdc; 4M contacts | 2 | 1 | 719B958 (Fig. 22) | 204C762G01 | 880A431 (Fig. 15) |

2M = 2 make (normally open)

2M-2B = 2 make, 2 break (2 normally open, 2 normally closed.

4M = 4 make (normally open)




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 | 849A437H04 | 1 | .047 MFD |
| | | | |
| DIODE | | | |
| D1 | 837A692H03 | 1 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1 | 185A212H06 | 1 | 1N3686B |
| Z2 | 186A797H06 | 1 | 1N957B |
| Z3-Z6 (125VDC) | 878A619H01 | 2 | 1.5KE200 |
| Z3-Z6 ( 48VDC) | 878A619H02 | 2 | 1.5KE68A |
| | | | |
| TRANSISTORS | | | |
| Q1-Q2 (125VDC) | 878A432H01 | 2 | 2N4063 |
| Q1-Q2 ( 48VDC) | 762A672H14 | 2 | 2N5681 |
| JUMPER J2 | 862A478H01 | 1 | 0Ω RESISTOR |
| RESISTOR | | | |
| R1 - R2 | 629A531H32 | 2 | 1KΩ-.5W-2% |
| R3 | 629A531H78 | 1 | 82KΩ-.5W-2% |
| R4 | 629A531H63 | 1 | 20KΩ-.5W-2% |
| R5 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R6 (125VDC) | 762A557H13 | 2 | 2.5KΩ-10W-2% |
| R9-R6 ( 48VDC) | 763A129H45 | 2 | .75KΩ-5W-5% |
| R9-R7 ( 48VDC) | 1202586 | 1 | 200 Ω-25W |
| R7 (125VDC) | 1207203 | 1 | 1500 Ω-25W |

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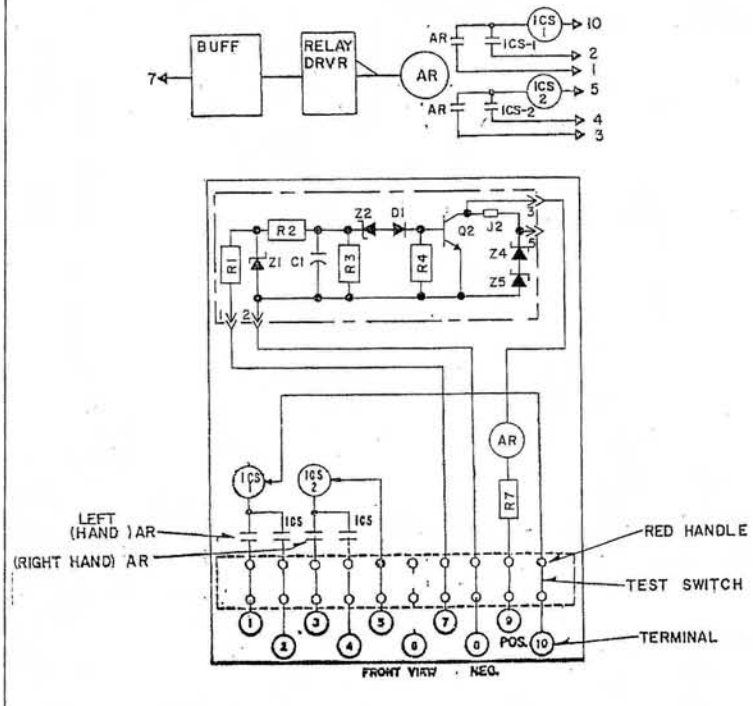
*Figure 1. Relay Type ARS*
*Single Input Buffer; 1 AR Unit with 2M Contacts; 2 ICS Units in FT-11 Case, 48 and 125 Vdc.*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 | 849A437H04 | 1 | .047 MFD |
| | | | |
| DIODE | | | |
| D1 | 837A692H03 | 1 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1 | 185A212H06 | 1 | 1N3686B |
| Z2 | 186A797H06 | 1 | 1N957B |
| Z4 - Z5 | 878A619H01 | 2 | 1.5KE200 |
| | | | |
| TRANSISTORS | | | |
| Q2 | 878A432H01 | 1 | 2N4063 |
| | | | |
| RESISTORS | | | |
| R1 - R2 | 629A531H32 | 2 | 1KΩ-.5W -2% |
| R3 | 629A531H78 | 1 | 82KΩ-.5W-2% |
| R4 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R7 (250V) | 1205222 | 1 | 6000 Ω- 25W |
| | | | |
| JUMPER | | | |
| J2 | 862A478H01 | 1 | 0Ω RESISTOR |

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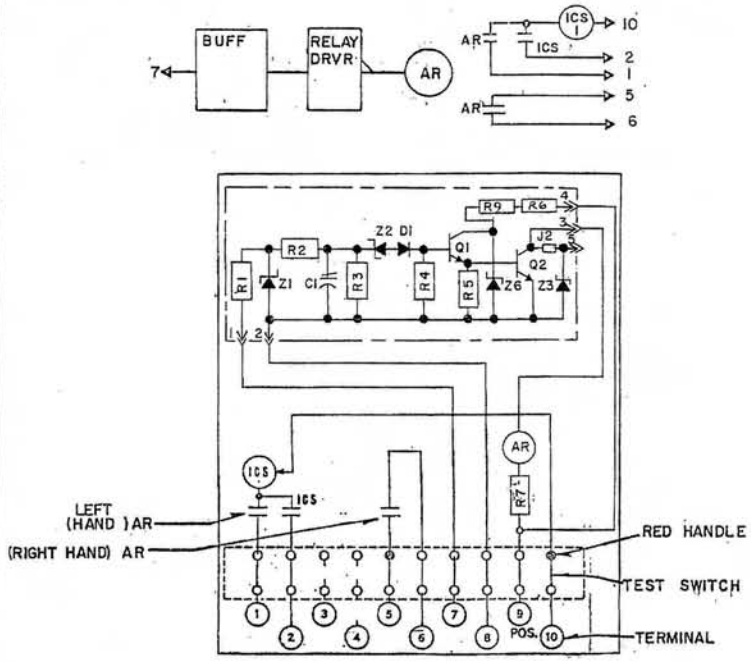
*Figure 2. Relay Type ARS*
*Single Input Buffer; 1 AR Unit with 2M Contacts; 2 ICS Units in FT-11 Case; 250 Vdc.*

* *Denotes change since previous issue*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 | 849A437H04 | 1 | .047 MFD |
| | | | |
| DIODE | | | |
| D1 | 837A692H03 | 1 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1 | 185A212H06 | 1 | 1N3686B |
| Z2 | 186A797H06 | 1 | 1N957B |
| Z3-Z6 (125VDC) | 878A619H01 | 2 | 1.5KE200 |
| Z3-Z6 ( 48VDC) | 878A619H02 | 2 | 1.5KE68A |
| | | | |
| TRANSISTORS | | | |
| Q1-Q2 (125VDC) | 878A432H01 | 2 | 2N4063 |
| Q1-Q2 ( 48VDC) | 762A672H14 | 2 | 2N5681 |
| JUMPER J2 | 862A478H01 | 1 | 0 Ω RESISTOR |
| RESISTOR | | | |
| R1-R2 | 629A531H32 | 2 | 1KΩ-.5W-2% |
| R3 | 629A531H78 | 1 | 82KΩ-.5W-2% |
| R4 | 629A531H63 | 1 | 20KΩ-.5W-2% |
| R5 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R9, R6 (125VDC) | 762A557H13 | 2 | 2.5KΩ-10W-2% |
| R9, R6 ( 48VDC) | 763A129H45 | 2 | .75KΩ-5W-5% |
| R7 ( 48VDC) | 1202586 | 1 | 200 Ω - 25W |
| R7 (125VDC) | 1267293 | 1 | 1500 Ω - 25W |

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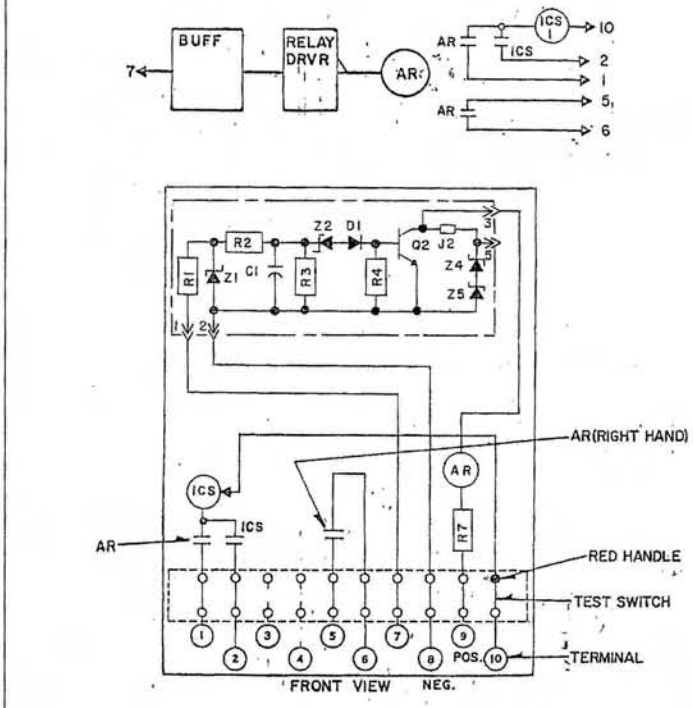
*Figure 3. Relay Type ARS*
*Single Input Buffer; 1 AR Unit with 2M Contacts; 1 ICS Unit in FT-11 Case; 48 and 125 Vdc.*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 | 849A437H04 | 1 | .047 MFD |
| | | | |
| DIODE | | | |
| D1 | 837A692H03 | 1 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1 | 185A212H06 | 1 | 1N3686B |
| Z2 | 186A797H06 | 1 | 1N957B |
| Z4-Z5 | 878A619H01 | 2 | 1.5KE200 |
| | | | |
| TRANSISTORS | | | |
| Q2 | 878A432H01 | 1 | 2N4063 |
| | | | |
| RESISTORS | | | |
| R1-R2 | 629A531H32 | 2 | 1KΩ-.5W-2% |
| R3 | 629A531H78 | 1 | 82KΩ-.5W-2% |
| R4 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R7 (250VDC) | 1205222 | 1 | 6000Ω - 25W |
| | | | |
| JUMPER | | | |
| J2 | 862A478H01 | 1 | 0Ω RESISTOR |

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*Figure 4. Relay Type ARS*
*Single Input Buffer; 1 AR Unit with 2M Contacts; 1 ICS Unit in FT-11 Case; 250 Vdc.*

* *Denotes change since previous issue*

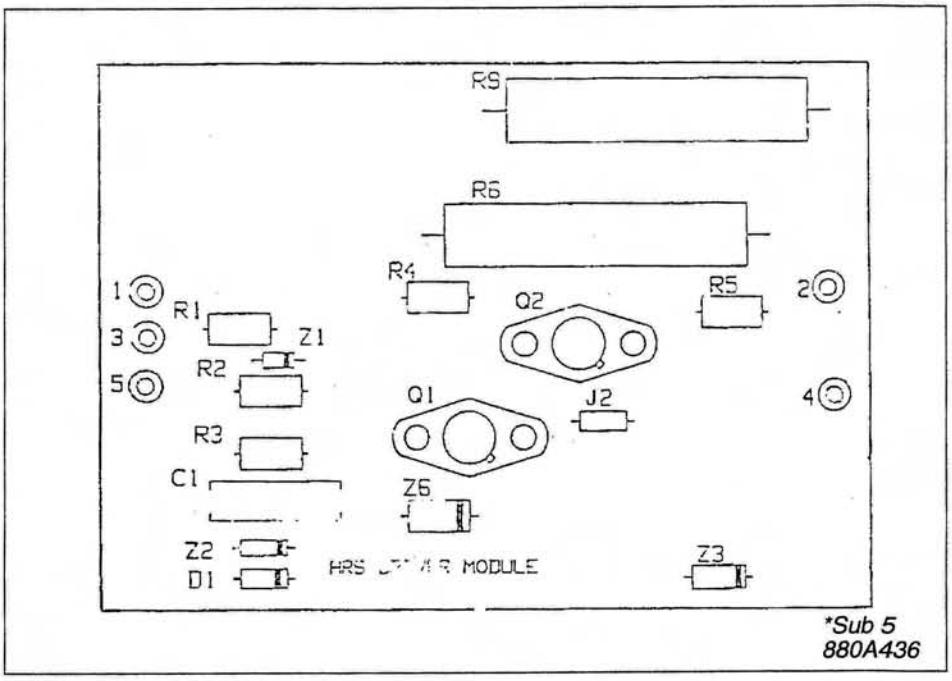



*Figure 5. Component Location*
*Single Input Buffer in Type FT-11 Case; 48 Vdc.*

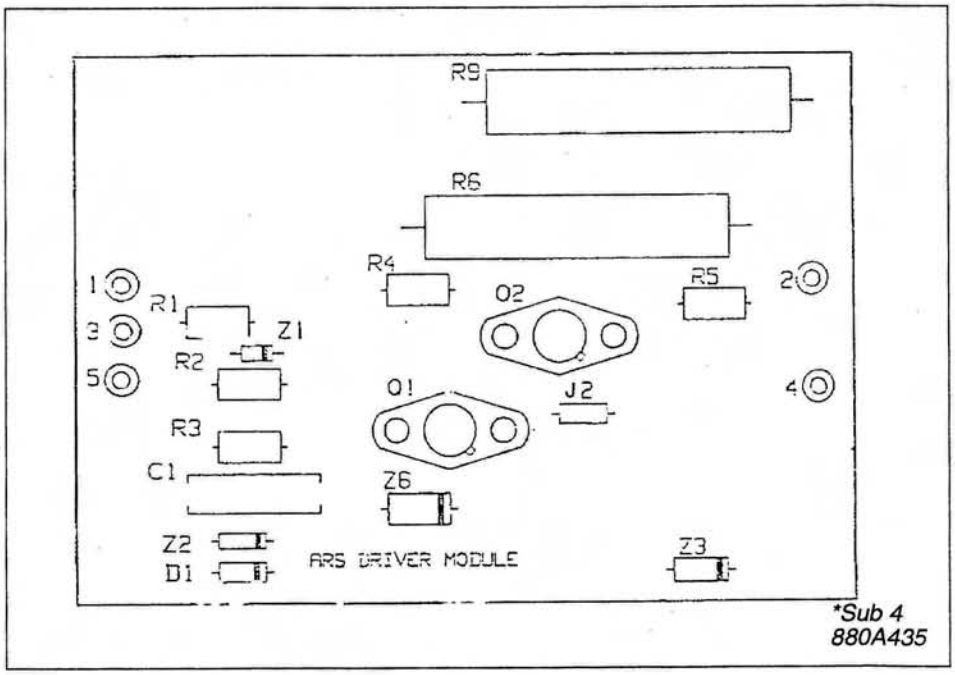



*Figure 6. Component Location*
*Single Input Buffer in FT-11 Case; 125 Vdc.*

** Denotes change since previous issue*

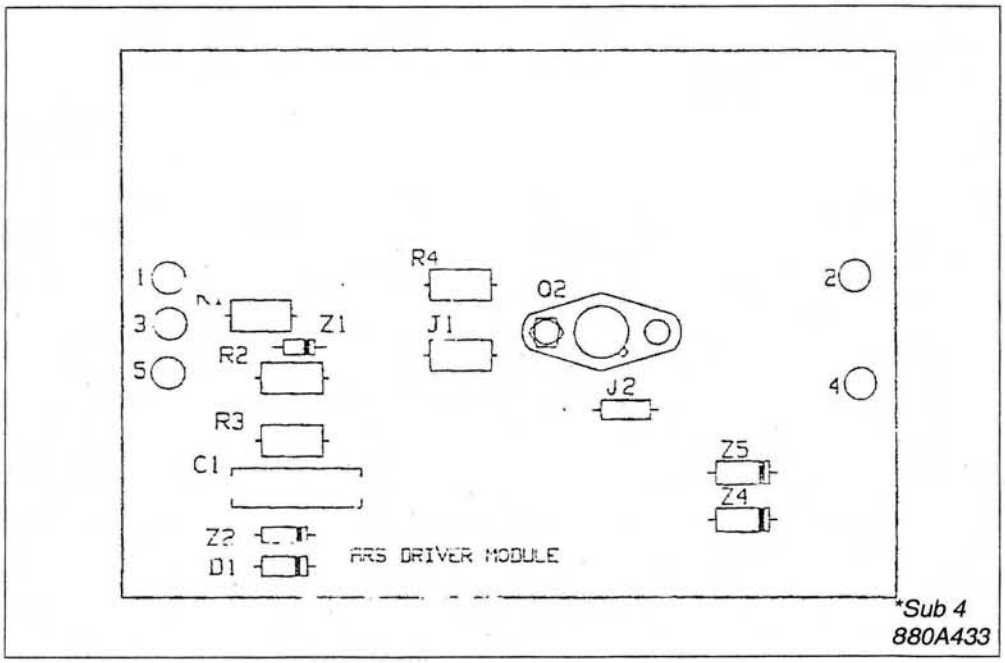
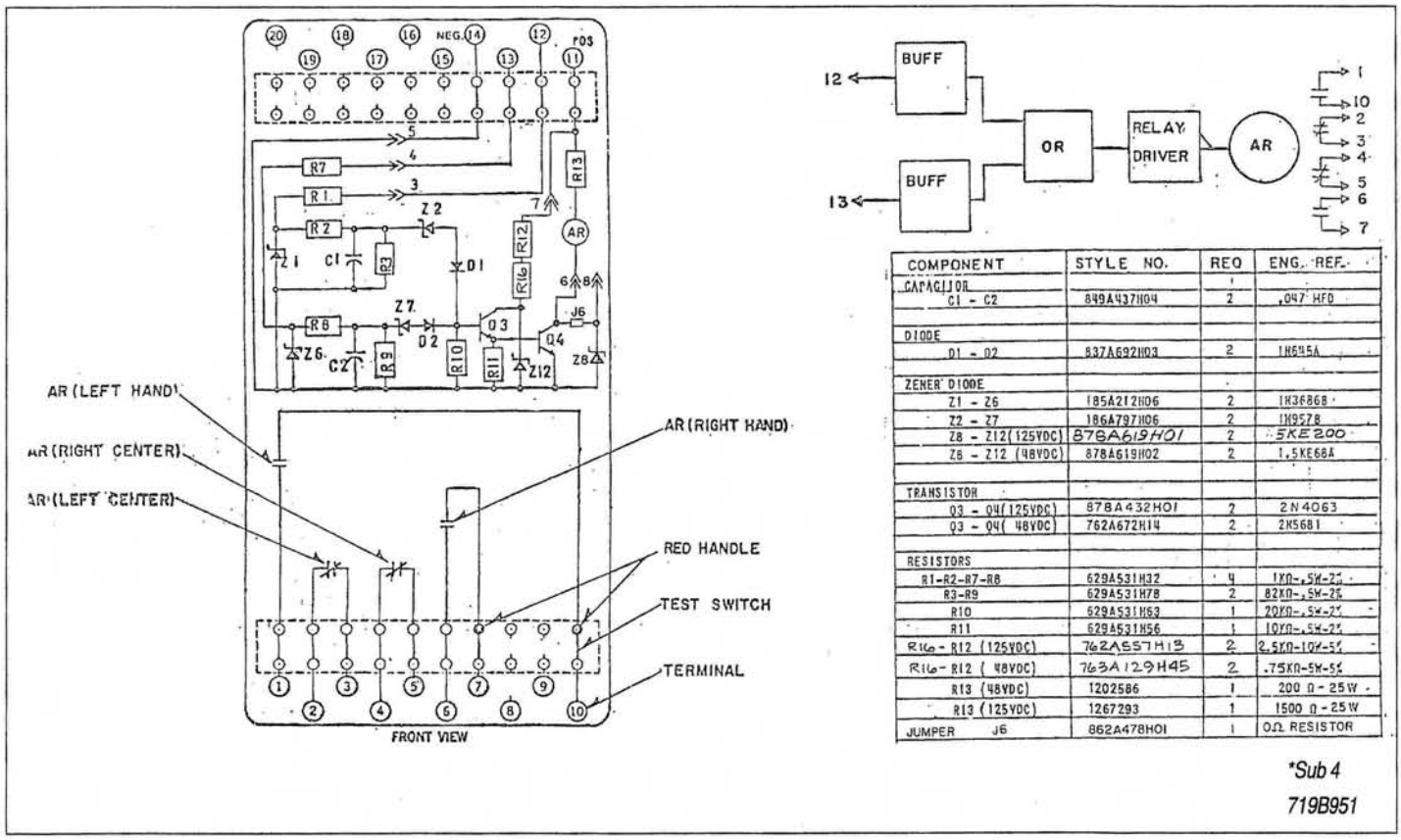


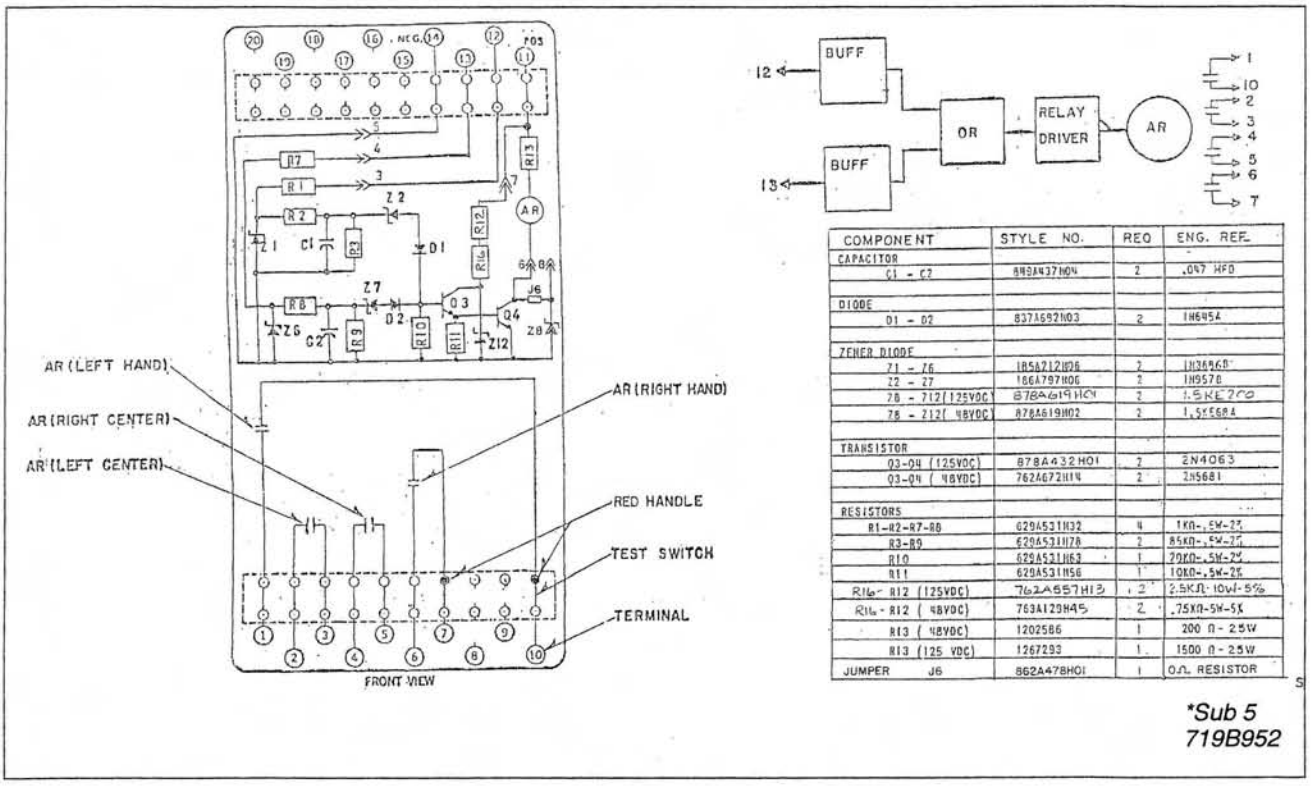

*Figure 7. Component Location*
*Single Input Buffer in FT-11 Case; 250 Vdc.*




| COMPONENT | STYLE NO. | REQ | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N957B |
| Z8 - Z12 (125VDC) | 878A619H01 | 2 | 5KE200 |
| Z8 - Z12 (48VDC) | 878A619H02 | 2 | 1.5KE68A |
| TRANSISTOR | | | |
| Q3 - Q4 (125VDC) | 878A432H01 | 2 | 2N4063 |
| Q3 - Q4 (48VDC) | 762A672H14 | 2 | 2N5681 |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R10 | 629A531H63 | 1 | 20KΩ-.5W-2% |
| R11 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R16-R12 (125VDC) | 762A557H13 | 2 | 2.5KΩ-10W-5% |
| R16-R12 (48VDC) | 763A129H45 | 2 | .75KΩ-5W-5% |
| R13 (48VDC) | 1202586 | 1 | 200 Ω-25W |
| R13 (125VDC) | 1267293 | 1 | 1500 Ω-25W |
| JUMPER J6 | 862A478H01 | 1 | 0Ω RESISTOR |

*Figure 8. Relay Type ARS*
*2 Buffered Input "OR"; 1 AR Unit 2M2B Contacts in FT-22 Case; 48 and 125 Vdc.*

* *Denotes change since previous issue*




| COMPONENT | STYLE NO. | REQ | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N957B |
| Z8 - Z12 (125VDC) | 878A619H01 | 2 | 1.5KE200 |
| Z8 - Z12 ( 48VDC) | 878A619H02 | 2 | 1.5KE68A |
| TRANSISTOR | | | |
| Q3-Q4 (125VDC) | 878A432H01 | 2 | 2N4063 |
| Q3-Q4 ( 48VDC) | 762A672H14 | 2 | 2N5681 |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R10 | 629A531H63 | 1 | 20KΩ-.5W-2% |
| R11 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R16- R12 (125VDC) | 762A557H13 | 2 | 2.5KΩ-10W-5% |
| R16- R12 ( 48VDC) | 763A129H45 | 2 | .75KΩ-5W-5% |
| R13 ( 48VDC) | 1202586 | 1 | 200 Ω - 25W |
| R13 (125 VDC) | 1267293 | 1 | 1500 Ω - 25W |
| JUMPER J6 | 862A478H01 | 1 | 0Ω RESISTOR |

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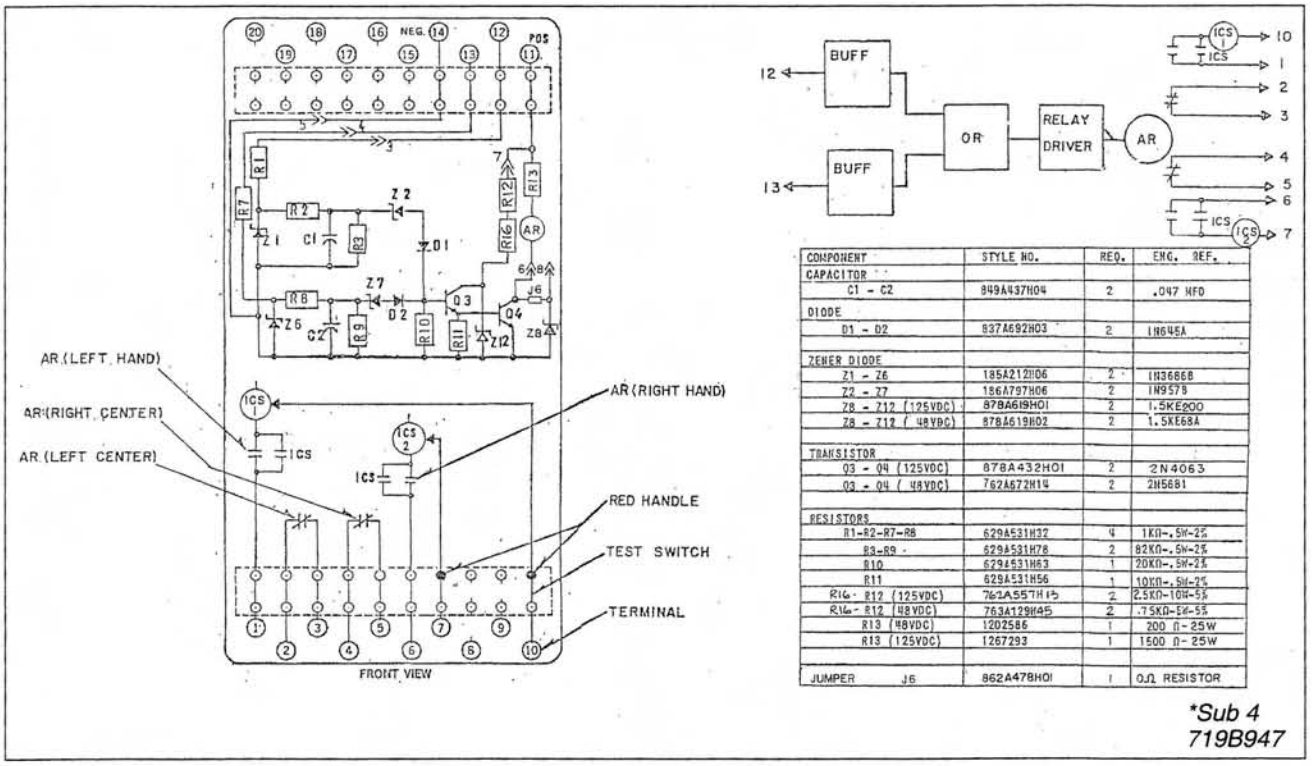
*Figure 9. Relay Type ARS*
*2 Buffered Input "OR"; 1 AR Unit 4M Contacts in FT-22 Case; 48 and 125 Vdc.*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N957B |
| Z8 - Z12 (125VDC) | 878A619H01 | 2 | 1.5KE200 |
| Z8 - Z12 ( 48VDC) | 878A619H02 | 2 | 1.5KE68A |
| TRANSISTOR | | | |
| Q3 - Q4 (125VDC) | 878A432H01 | 2 | 2N4063 |
| Q3 - Q4 ( 48VDC) | 762A672H14 | 2 | 2N5681 |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R10 | 629A531H63 | 1 | 20KΩ-.5W-2% |
| R11 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R16- R12 (125VDC) | 762A557H13 | 2 | 2.5KΩ-10W-5% |
| R16- R12 (48VDC) | 763A129H45 | 2 | .75KΩ-5W-5% |
| R13 (48VDC) | 1202586 | 1 | 200 Ω - 25W |
| R13 (125VDC) | 1267293 | 1 | 1500 Ω - 25W |
| JUMPER J6 | 862A478H01 | 1 | 0Ω RESISTOR |

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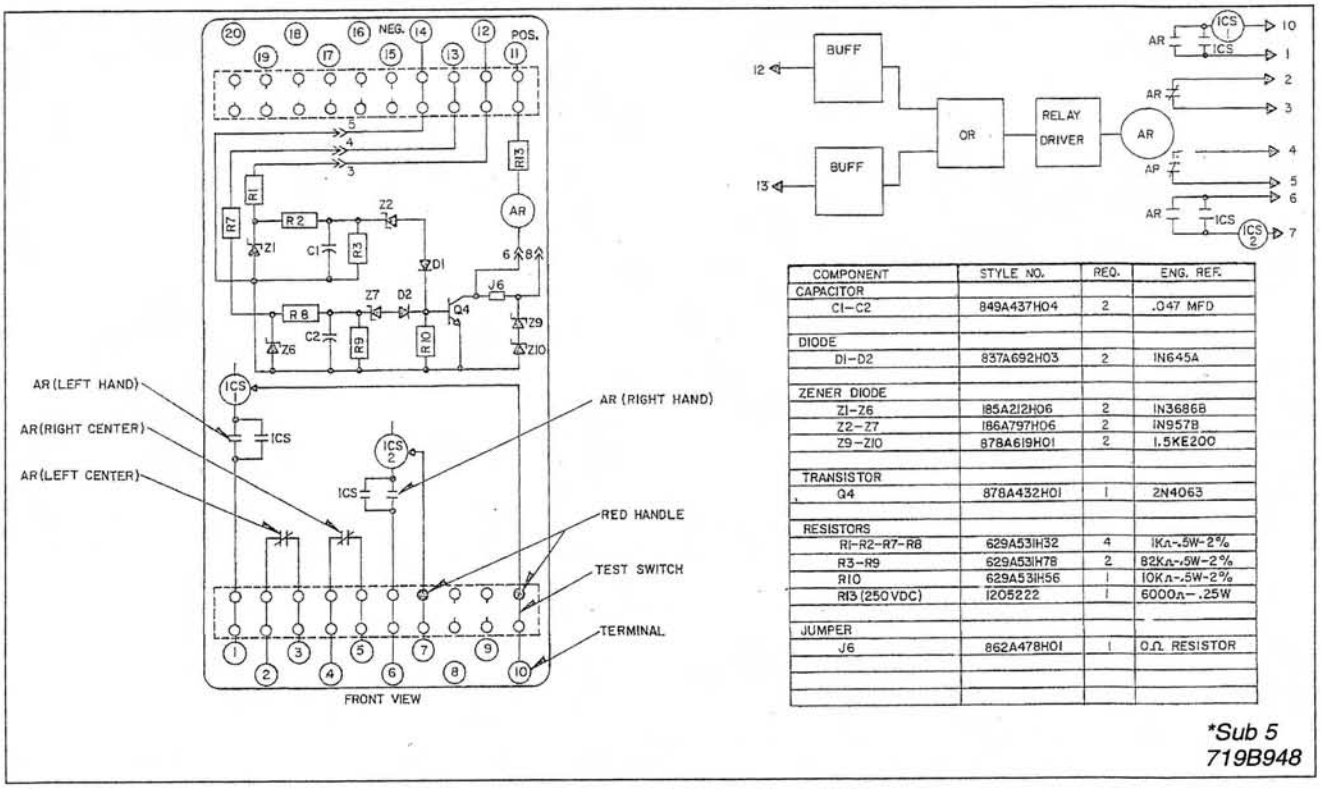
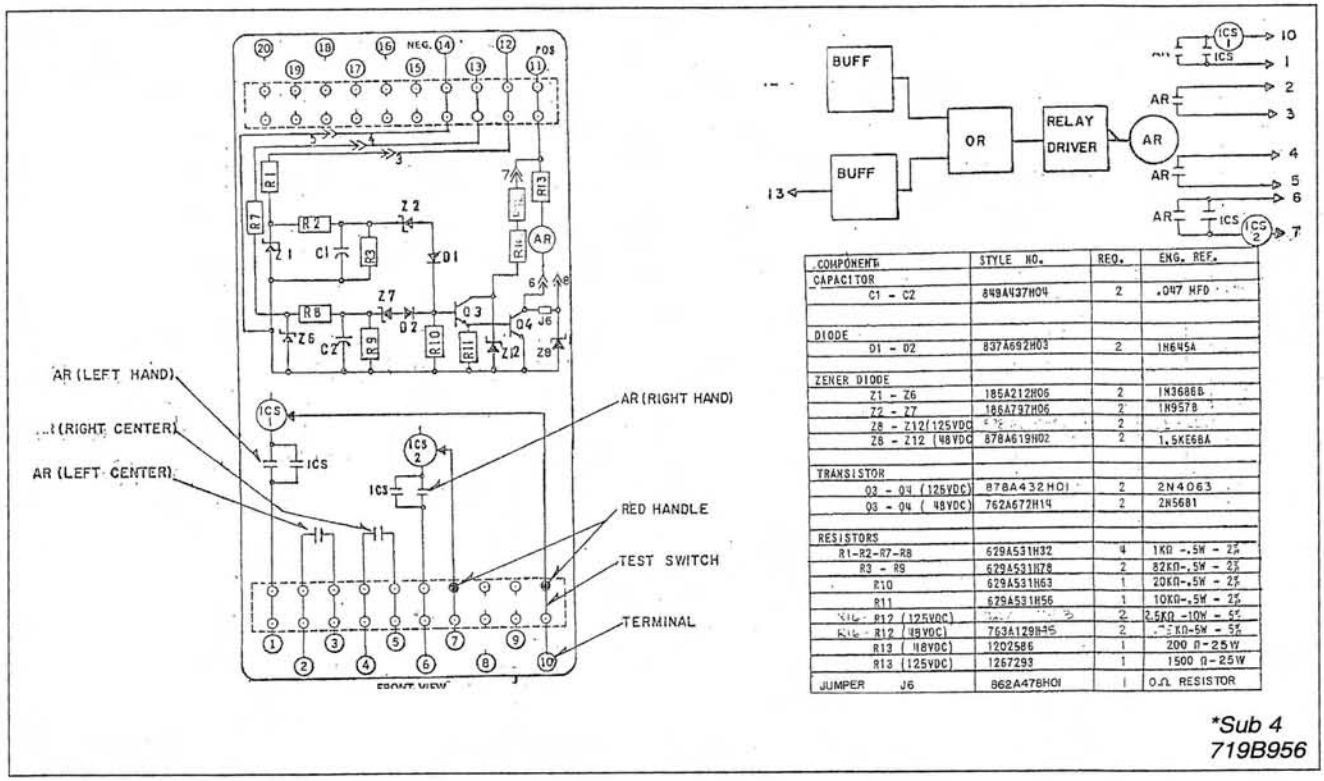
*Figure 10. Relay Type ARS*
*2 Buffered Input "OR"; 1 AR Unit 2M2b Contacts; 2 ICS Units in FT-22 Case.*

* *Denotes change since previous issue*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1-C2 | 849A437H04 | 2 | .047 MFD |
| DIODE | | | |
| D1-D2 | 837A692H03 | 2 | 1N645A |
| ZENER DIODE | | | |
| Z1-Z6 | 185A212H06 | 2 | 1N3686B |
| Z2-Z7 | 186A797H06 | 2 | 1N957B |
| Z9-Z10 | 878A619H01 | 2 | 1.5KE200 |
| TRANSISTOR | | | |
| Q4 | 878A432H01 | 1 | 2N4063 |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R10 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R13 (250VDC) | 1205222 | 1 | 6000Ω-.25W |
| JUMPER | | | |
| J6 | 862A478H01 | 1 | 0.Ω RESISTOR |

*Figure 11. Relay Type ARS*
*2 Buffered Input "OR"; 1 AR Unit 2M2B Contacts; 2 ICS Units in Ft-22 Case; 250 Vdc.*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N957B |
| Z8 - Z12 (125VDC | | 2 | |
| Z8 - Z12 (48VDC | 878A619H02 | 2 | 1.5KE68A |
| TRANSISTOR | | | |
| Q3 - Q4 (125VDC) | 878A432H01 | 2 | 2N4063 |
| Q3 - Q4 ( 48VDC) | 762A672H14 | 2 | 2N5681 |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ -.5W - 2% |
| R3 - R9 | 629A531H78 | 2 | 82KΩ-.5W - 2% |
| R10 | 629A531H63 | 1 | 20KΩ-.5W - 2% |
| R11 | 629A531H56 | 1 | 10KΩ-.5W - 2% |
| R12 (125VDC) | | 2 | 2.5KΩ -10W - 5% |
| R12 (48VDC) | 763A129H35 | 2 | .75KΩ-5W - 5% |
| R13 ( 48VDC) | 1202586 | 1 | 200 Ω-25W |
| R13 (125VDC) | 1267293 | 1 | 1500 Ω-25W |
| JUMPER J6 | 862A478H01 | 1 | 0.Ω RESISTOR |

*Figure 12. Relay Type ARS*
*2 Buffered Input "OR"; 1 AR Unit 4M Contacts; 2 ICS Units in Ft-22 Case; 48 and 125 Vdc.*

* *Denotes change since previous issue*

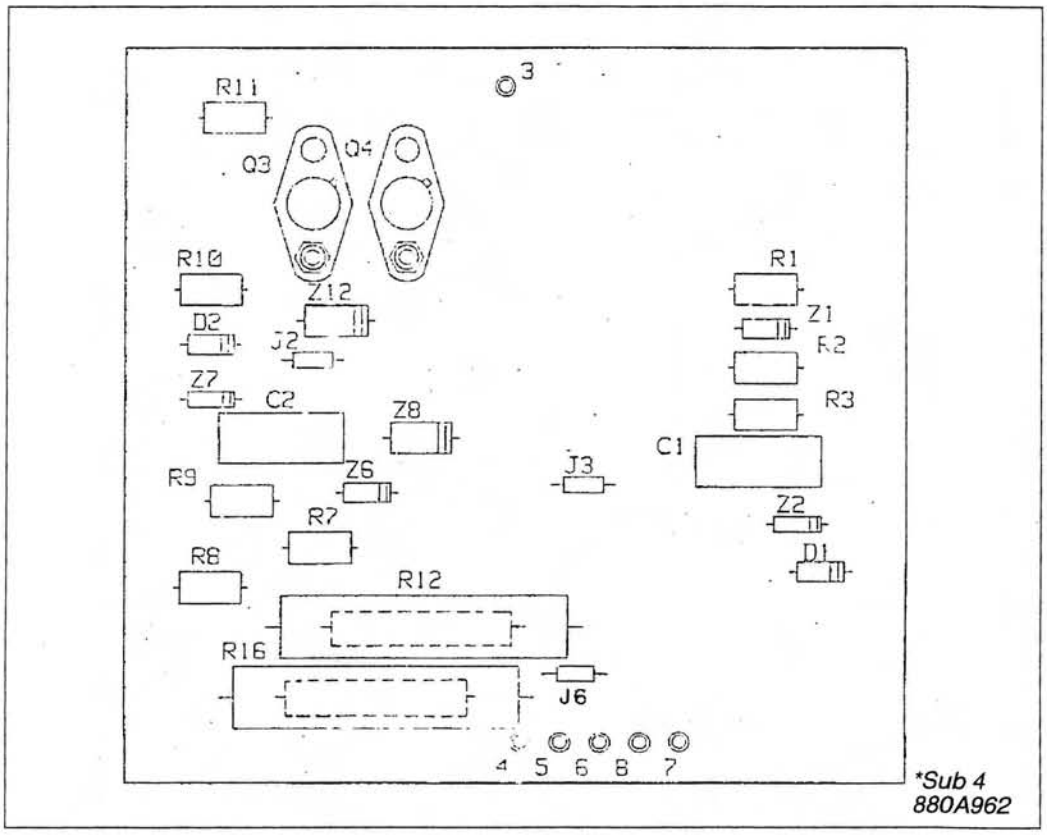



*Figure 13. Component Location*
*2 Buffered Input "OR" in FT-22 Case; 48 Vdc.*

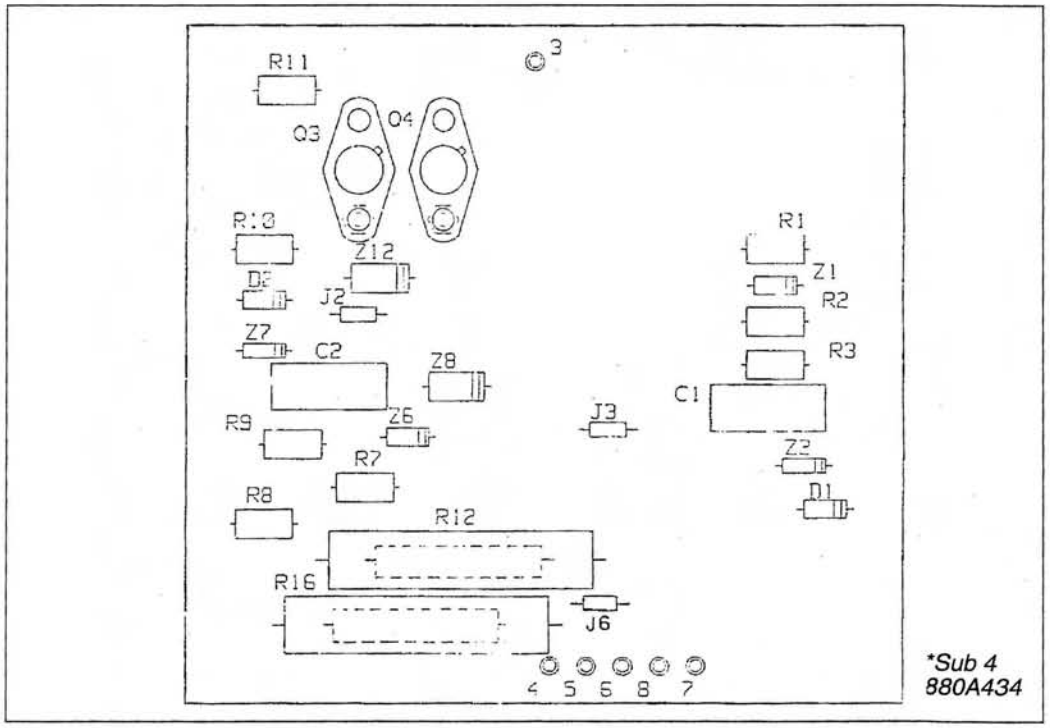



*Figure 14. Component Location*
*2 Buffered Input "OR" in Ft-22 Case; 125 Vdc.*

* *Denotes change since previous issue*

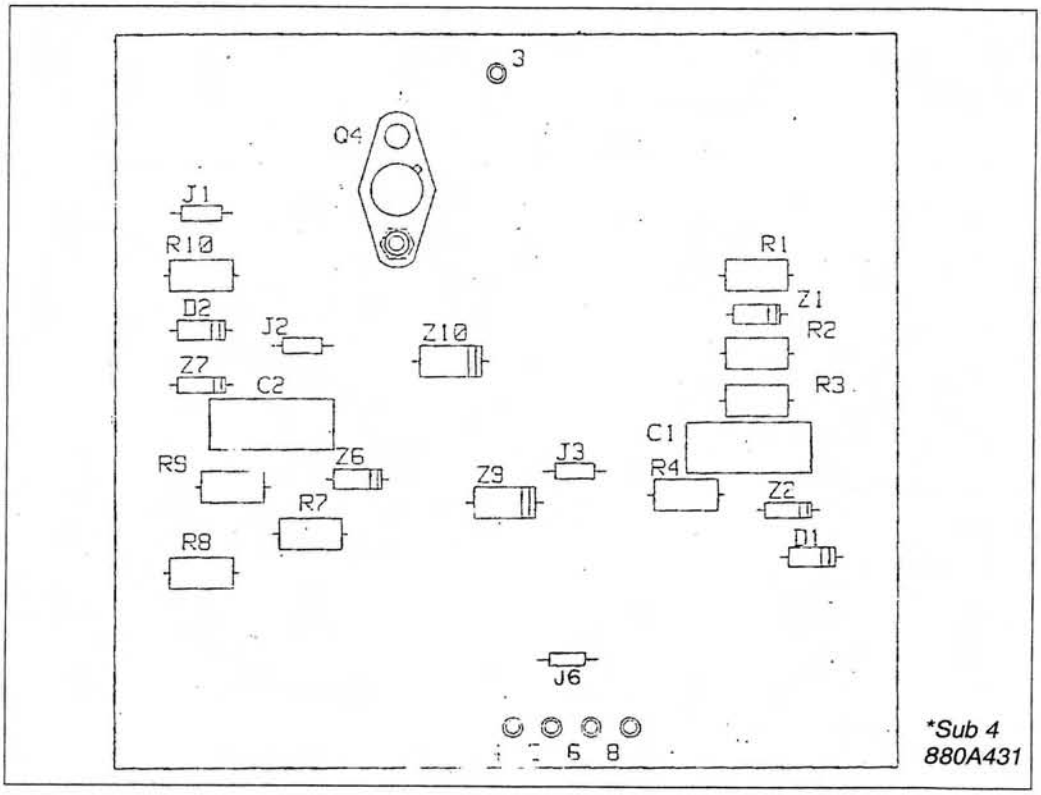
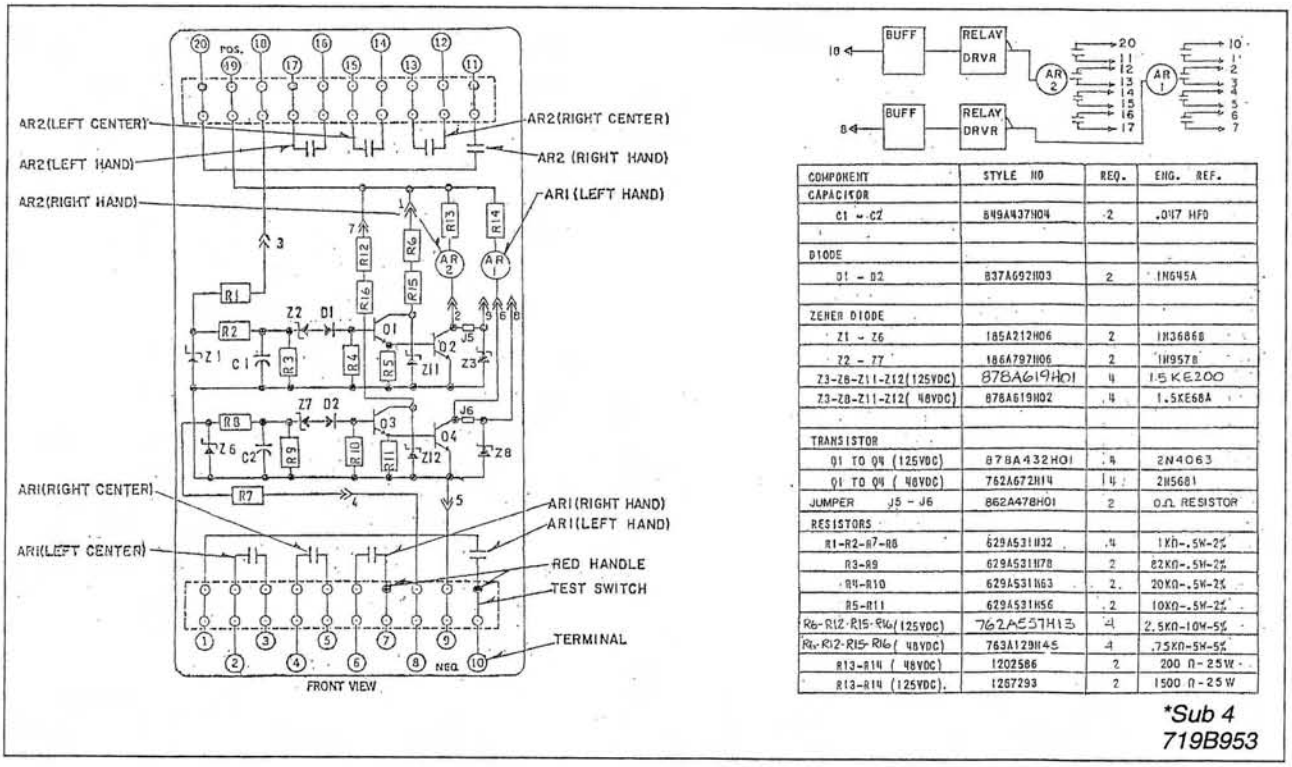


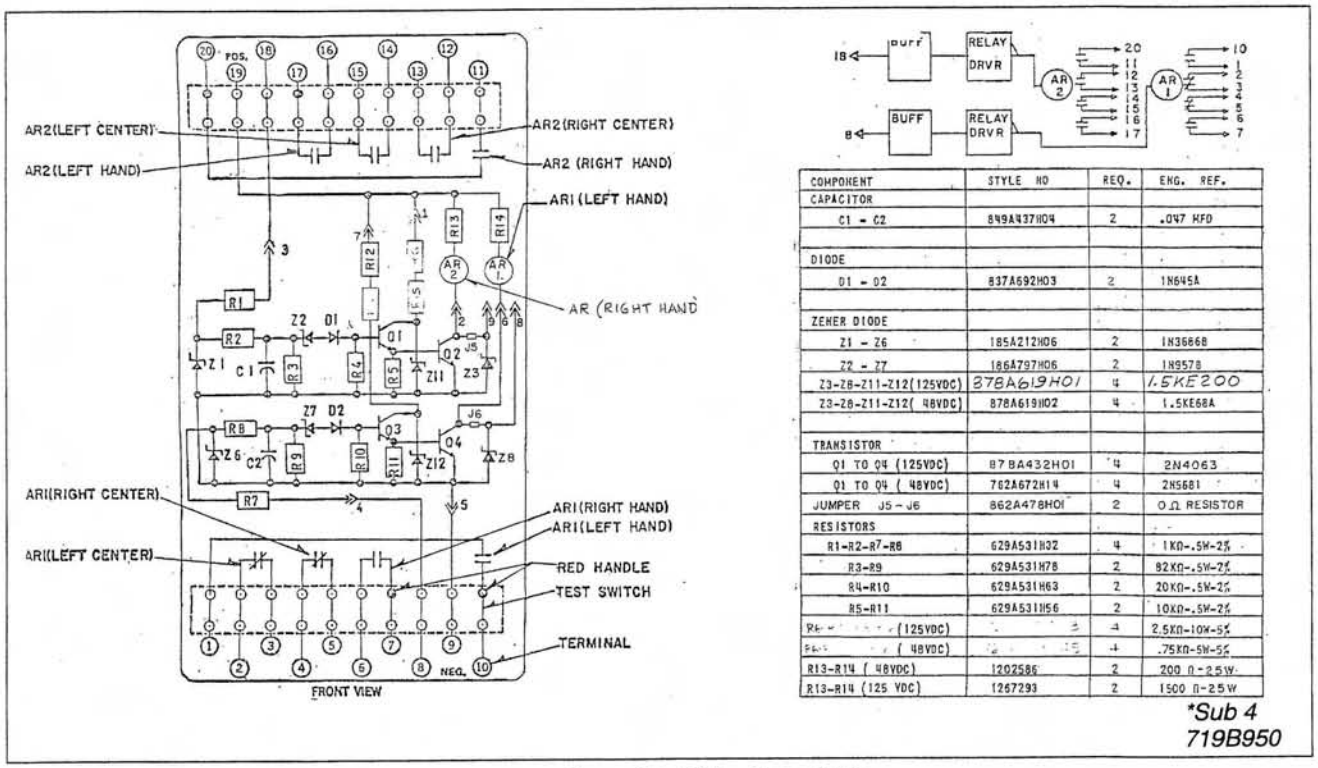

*Figure 15. Component Location*
*2 Buffered Input "OR" in FT-22 Case; 250 Vdc.*




| COMPONENT | STYLE NO | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| | | | |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A792H06 | 2 | 1N957B |
| Z3-Z8-Z11-Z12(125VDC) | 878A619H01 | 4 | 1.5KE200 |
| Z3-Z8-Z11-Z12( 48VDC) | 878A619H02 | 4 | 1.5KE68A |
| | | | |
| TRANSISTOR | | | |
| Q1 TO Q4 (125VDC) | 878A432H01 | 4 | 2N4063 |
| Q1 TO Q4 ( 48VDC) | 762A672H14 | 4 | 2N5681 |
| JUMPER J5 - J6 | 862A478H01 | 2 | 0Ω RESISTOR |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R4-R10 | 629A531H63 | 2 | 20KΩ-.5W-2% |
| R5-R11 | 629A531H56 | 2 | 10KΩ-.5W-2% |
| R6-R12-R15-R16(125VDC) | 762A657H13 | 4 | 2.5KΩ-10W-5% |
| R6-R12-R15-R16( 48VDC) | 763A129H45 | 4 | .75KΩ-5W-5% |
| R13-R14 ( 48VDC) | 1202586 | 2 | 200 Ω-25W |
| R13-R14 (125VDC). | 1257293 | 2 | 1500 Ω-25W |

*Figure 16. Relay Type ARS*
*2 Single Buffered Inputs; 2 AR Units (All Make) Contacts in FT-22 Case; 48 and 125 Vdc.*

* *Denotes change since previous issue*




| COMPONENT | STYLE NO | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| | | | |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N9578 |
| Z3-Z8-Z11-Z12(125VDC) | 878A619H01 | 4 | 1.5KE200 |
| Z3-Z8-Z11-Z12( 48VDC) | 878A619H02 | 4 | 1.5KE68A |
| | | | |
| TRANSISTOR | | | |
| Q1 TO Q4 (125VDC) | 878A432H01 | 4 | 2N4063 |
| Q1 TO Q4 ( 48VDC) | 762A672H14 | 4 | 2N5681 |
| JUMPER J5 - J6 | 862A478H01 | 2 | 0Ω RESISTOR |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R4-R10 | 629A531H63 | 2 | 20KΩ-.5W-2% |
| R5-R11 | 629A531H56 | 2 | 10KΩ-.5W-2% |
| R6-R12-R15-R16 (125VDC) | | 4 | 2.5KΩ-10W-5% |
| R6-R12-R15-R16 ( 48VDC) | | 4 | .75KΩ-5W-5% |
| R13-R14 ( 48VDC) | 1202586 | 2 | 200 Ω-25W |
| R13-R14 (125 VDC) | 1267293 | 2 | 1500 Ω-25W |

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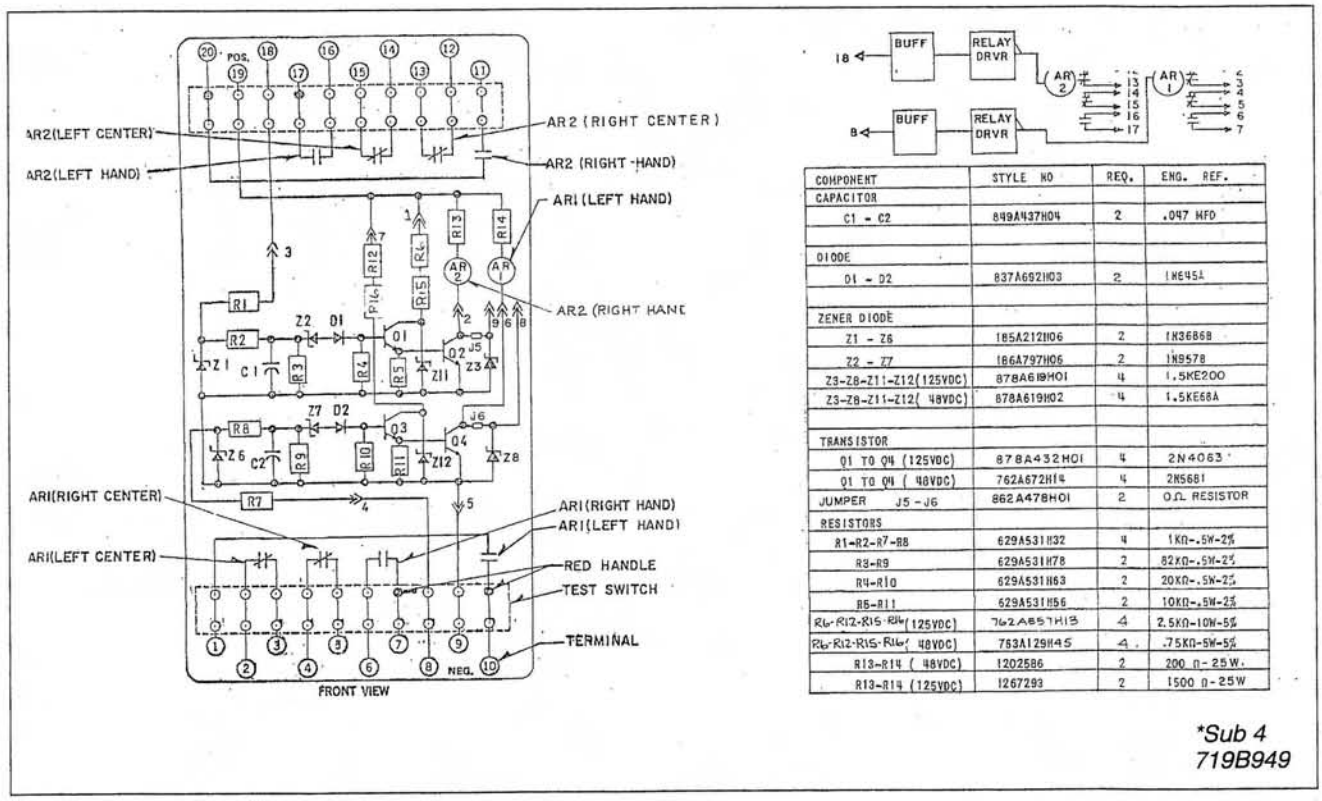
*Figure 17. Relay Type ARS*
*2 Single Buffered Inputs; 2 AR Units 4M-2M2B Contacts in Ft-22 Case; 48 and 125 Vdc.*




| COMPONENT | STYLE NO | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| | | | |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N9578 |
| Z3-Z8-Z11-Z12(125VDC) | 878A619H01 | 4 | 1.5KE200 |
| Z3-Z8-Z11-Z12( 48VDC) | 878A619H02 | 4 | 1.5KE68A |
| | | | |
| TRANSISTOR | | | |
| Q1 TO Q4 (125VDC) | 878A432H01 | 4 | 2N4063 |
| Q1 TO Q4 ( 48VDC) | 762A672H14 | 4 | 2N5681 |
| JUMPER J5 - J6 | 862A478H01 | 2 | 0Ω RESISTOR |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R4-R10 | 629A531H63 | 2 | 20KΩ-.5W-2% |
| R5-R11 | 629A531H56 | 2 | 10KΩ-.5W-2% |
| R6-R12-R15-R16 (125VDC) | 762A857H13 | 4 | 2.5KΩ-10W-5% |
| R6-R12-R15-R16 ( 48VDC) | 753A129H45 | 4 | .75KΩ-5W-5% |
| R13-R14 ( 48VDC) | 1202586 | 2 | 200 Ω-25W |
| R13-R14 (125VDC) | 1267293 | 2 | 1500 Ω-25W |

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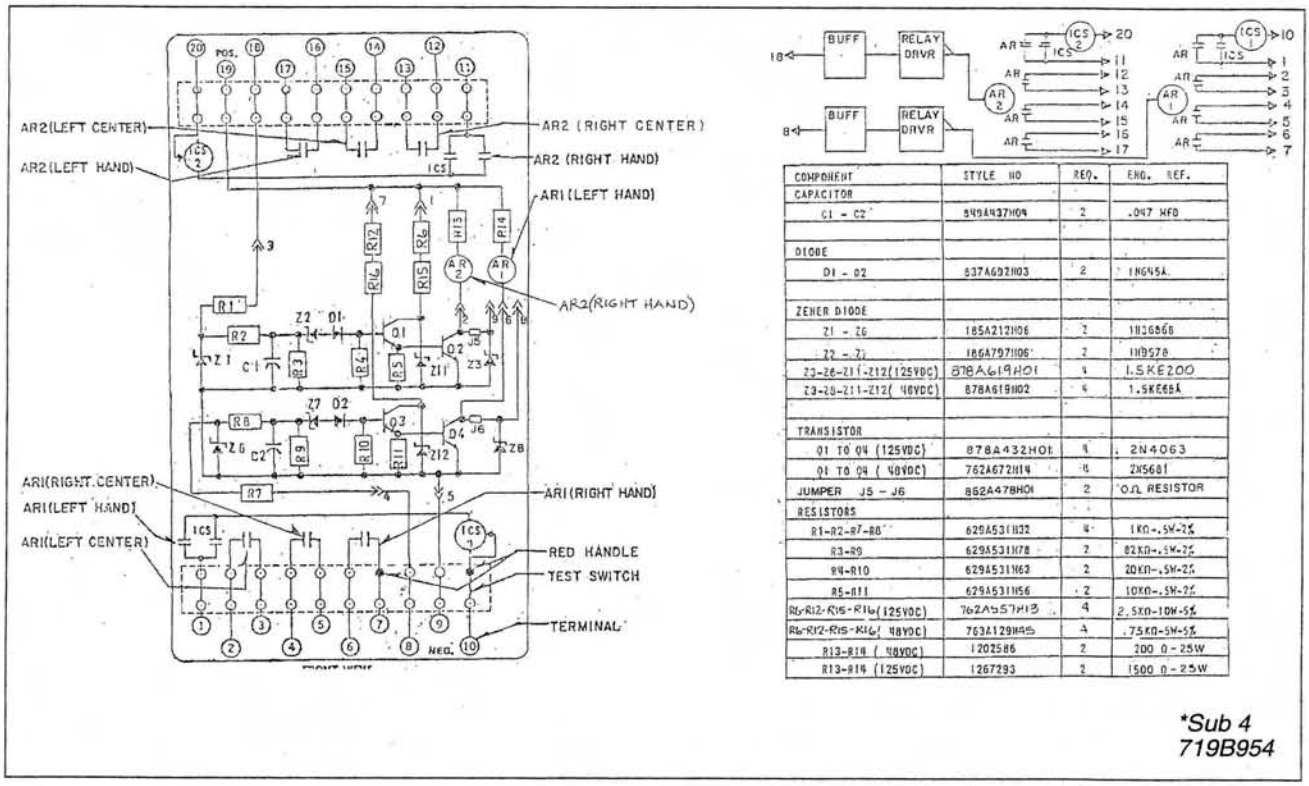
*Figure 18. Relay Type ARS*
*2 Single Buffered Inputs; 2 AR Units 2M2B-2M2B Contacts in Ft-22 Case; 48 and 125 Vdc.*

* *Denotes change since previous issue*




| COMPONENT | STYLE NO | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| | | | |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N957B |
| Z3-Z8-Z11-Z12(125VDC) | 878A619H01 | 4 | 1.5KE200 |
| Z3-Z8-Z11-Z12( 48VDC) | 878A619H02 | 4 | 1.5KE68A |
| | | | |
| TRANSISTOR | | | |
| Q1 TO Q4 (125VDC) | 878A432H01 | 4 | 2N4063 |
| Q1 TO Q4 ( 48VDC) | 762A672H14 | 4 | 2N5681 |
| JUMPER J5 - J6 | 862A478H01 | 2 | 0Ω RESISTOR |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R4-R10 | 629A531H63 | 2 | 20KΩ-.5W-2% |
| R5-R11 | 629A531H56 | 2 | 10KΩ-.5W-2% |
| R6-R12-R15-R16(125VDC) | 762A557H13 | 4 | 2.5KΩ-10W-5% |
| R6-R12-R15-R16( 48VDC) | 763A129H45 | 4 | .75KΩ-5W-5% |
| R13-R14 ( 48VDC) | 1202586 | 2 | 200 Ω - 25W |
| R13-R14 (125VDC) | 1267293 | 2 | 1500 Ω - 25W |

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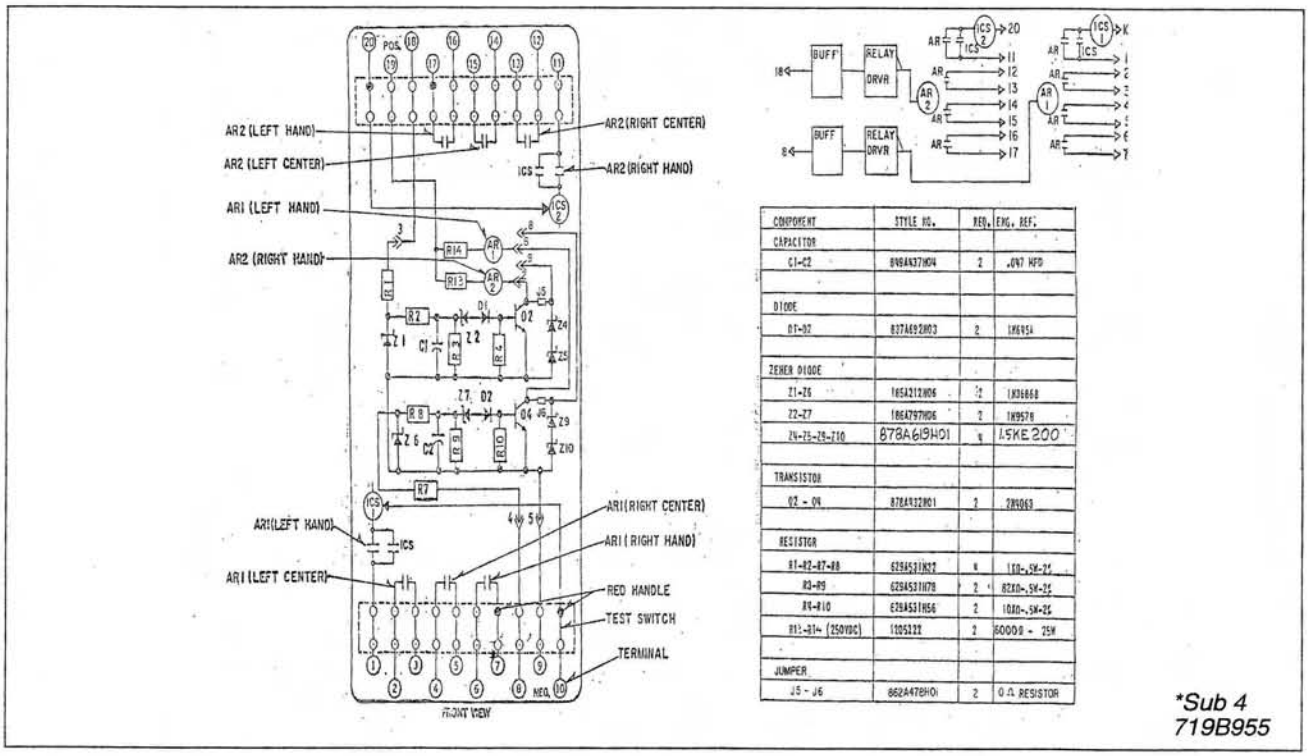
*Figure 19. Relay Type ARS*
*2 Single Buffered Inputs; 2 AR Units (All Make) Contacts; 2 ICS Units in FT-22 Case; 48 and 125 Vdc.*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1-C2 | 849A437H04 | 2 | .047 MFD |
| | | | |
| DIODE | | | |
| D1-D2 | 837A692H03 | 2 | 1N645A |
| | | | |
| ZENER DIODE | | | |
| Z1-Z6 | 185A212H06 | 2 | 1N3686B |
| Z2-Z7 | 186A797H06 | 2 | 1N957B |
| Z4-Z5-Z8-Z10 | 878A619H01 | 4 | 1.5KE200 |
| | | | |
| TRANSISTOR | | | |
| Q2 - Q4 | 878A432H01 | 3 | 2N4063 |
| | | | |
| RESISTOR | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R4-R10 | 629A531H56 | 2 | 10KΩ-.5W-2% |
| R11-R14 (250VDC) | 1205322 | 2 | 6000Ω - 25W |
| | | | |
| JUMPER | | | |
| J5 - J6 | 862A478H01 | 2 | 0 Ω RESISTOR |

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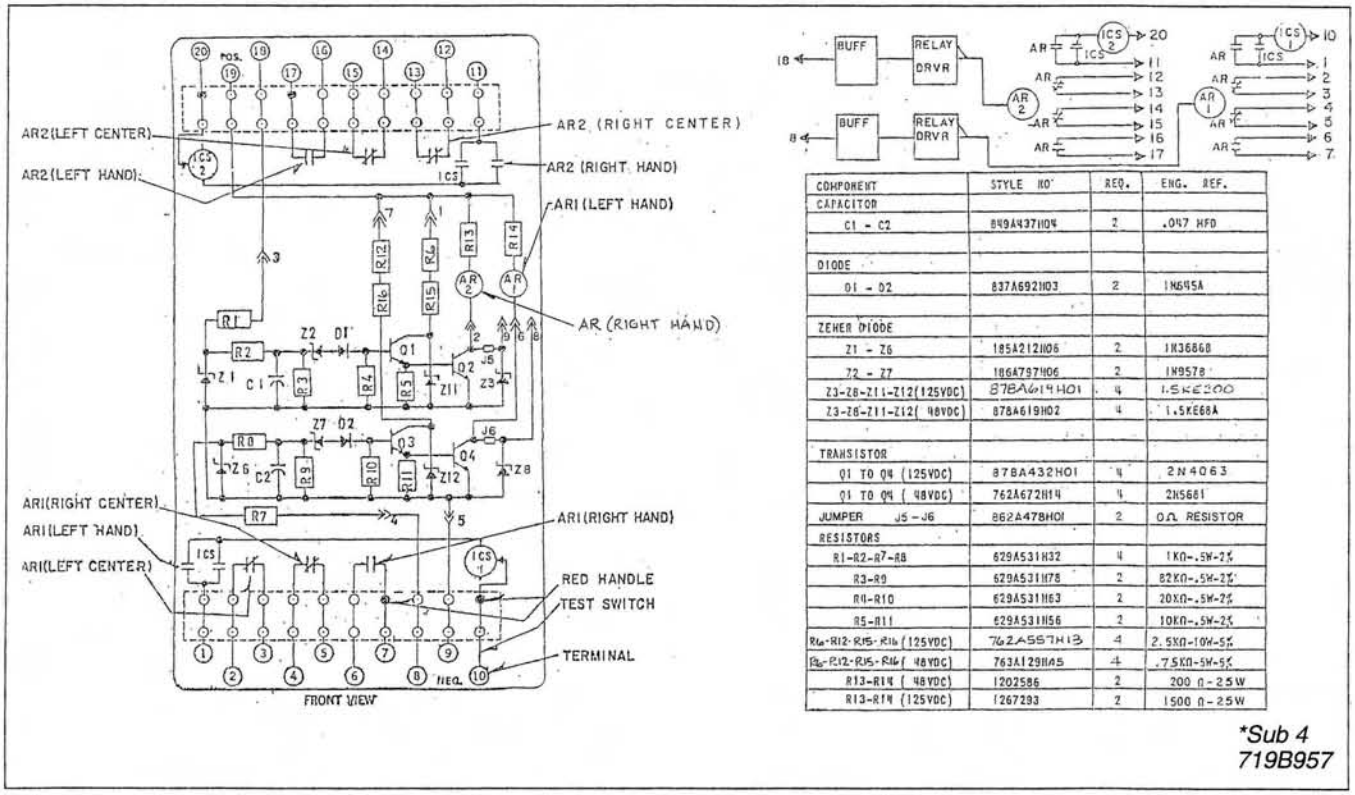
*Figure 20. Relay Type ARS*
*2 Single Buffered Inputs; 2 AR Units 4M-4M Contacts; 2 ICS Units in Ft-22 Case; 250 Vdc.*

* *Denotes change since previous issue*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| DIODE | | | |
| D1 - D2 | 837A692H03 | 2 | 1N645A |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N9578 |
| Z3-Z8-Z11-Z12(125VDC) | 878A619H01 | 4 | 1.5KE200 |
| Z3-Z8-Z11-Z12( 48VDC) | 878A619H02 | 4 | 1.5KE68A |
| TRANSISTOR | | | |
| Q1 TO Q4 (125VDC) | 878A432H01 | 4 | 2N4063 |
| Q1 TO Q4 ( 48VDC) | 762A672H14 | 4 | 2N5681 |
| JUMPER J5 - J6 | 862A478H01 | 2 | 0Ω RESISTOR |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R4-R10 | 629A531H63 | 2 | 20KΩ-.5W-2% |
| R5-R11 | 629A531H56 | 2 | 10KΩ-.5W-2% |
| R6-R12-R15-R16 (125VDC) | 762A557H13 | 4 | 2.5KΩ-10W-5% |
| R6-R12-R15-R16( 48VDC) | 763A129H45 | 4 | .75KΩ-5W-5% |
| R13-R14 ( 48VDC) | 1202586 | 2 | 200 Ω-25W |
| R13-R14 (125VDC) | 1267293 | 2 | 1500 Ω-25W |

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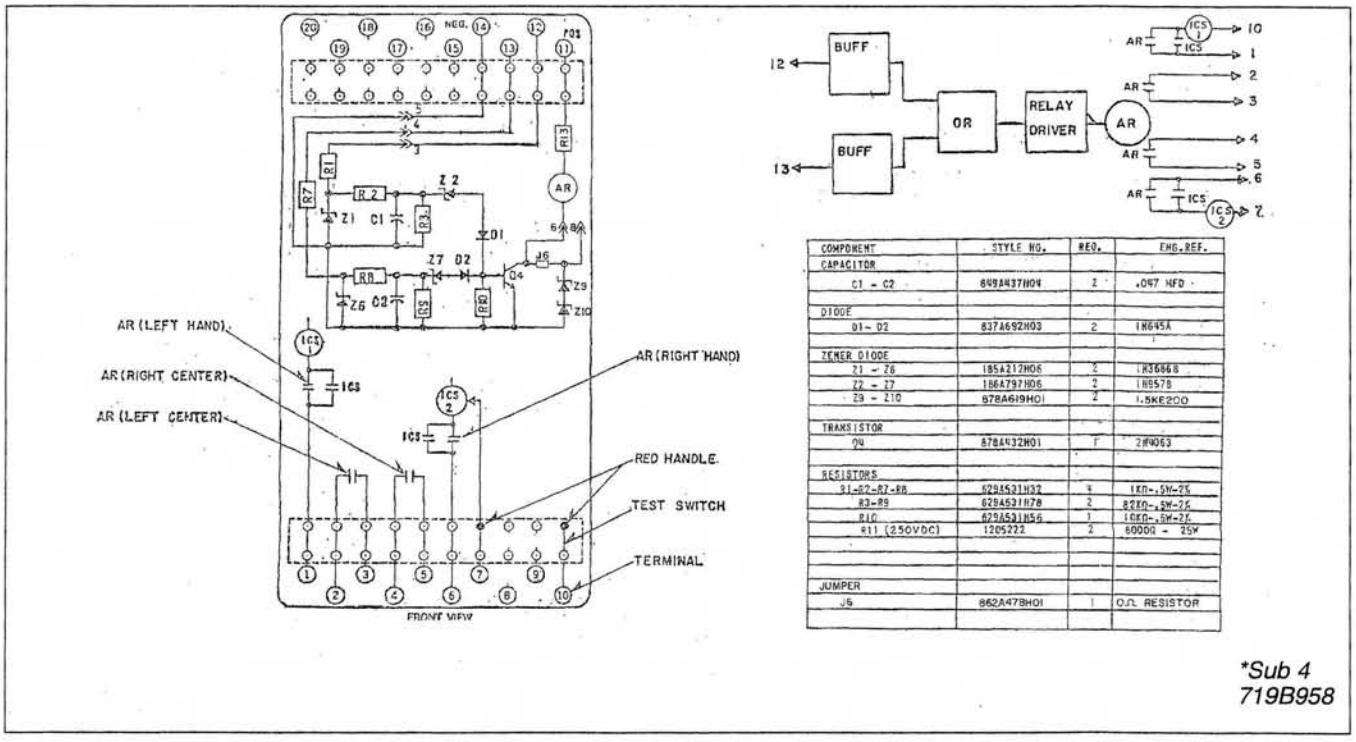
*Figure 21. Relay Type ARS*
*2 Single Buffered Inputs; 2 AR Units 2M2B-2M2B Contacts; 2 ICS Units in FT-22 Case; 125 Vdc.*




| COMPONENT | STYLE NO. | REQ. | ENG. REF. |
|---|---|---|---|
| CAPACITOR | | | |
| C1 - C2 | 849A437H04 | 2 | .047 MFD |
| DIODE | | | |
| D1- D2 | 837A692H03 | 2 | 1N645A |
| ZENER DIODE | | | |
| Z1 - Z6 | 185A212H06 | 2 | 1N3686B |
| Z2 - Z7 | 186A797H06 | 2 | 1N9578 |
| Z3 - Z10 | 878A619H01 | 2 | 1.5KE200 |
| TRANSISTOR | | | |
| Q4 | 878A432H01 | 1 | 2N4063 |
| RESISTORS | | | |
| R1-R2-R7-R8 | 629A531H32 | 4 | 1KΩ-.5W-2% |
| R3-R9 | 629A531H78 | 2 | 82KΩ-.5W-2% |
| R10 | 629A531H56 | 1 | 10KΩ-.5W-2% |
| R11 (250VDC) | 1205222 | 2 | 50000 - 25W |
| JUMPER | | | |
| J6 | 862A478H01 | 1 | 0Ω RESISTOR |

*Sub 4
719B958

*Figure 22. Relay Type ARS*
*2 Buffered Input "OR"; 1 AR Unit 4M Contacts; 2 ICS Units in FT-22 Case; 250 Vdc.*

* *Denotes change since previous issue*

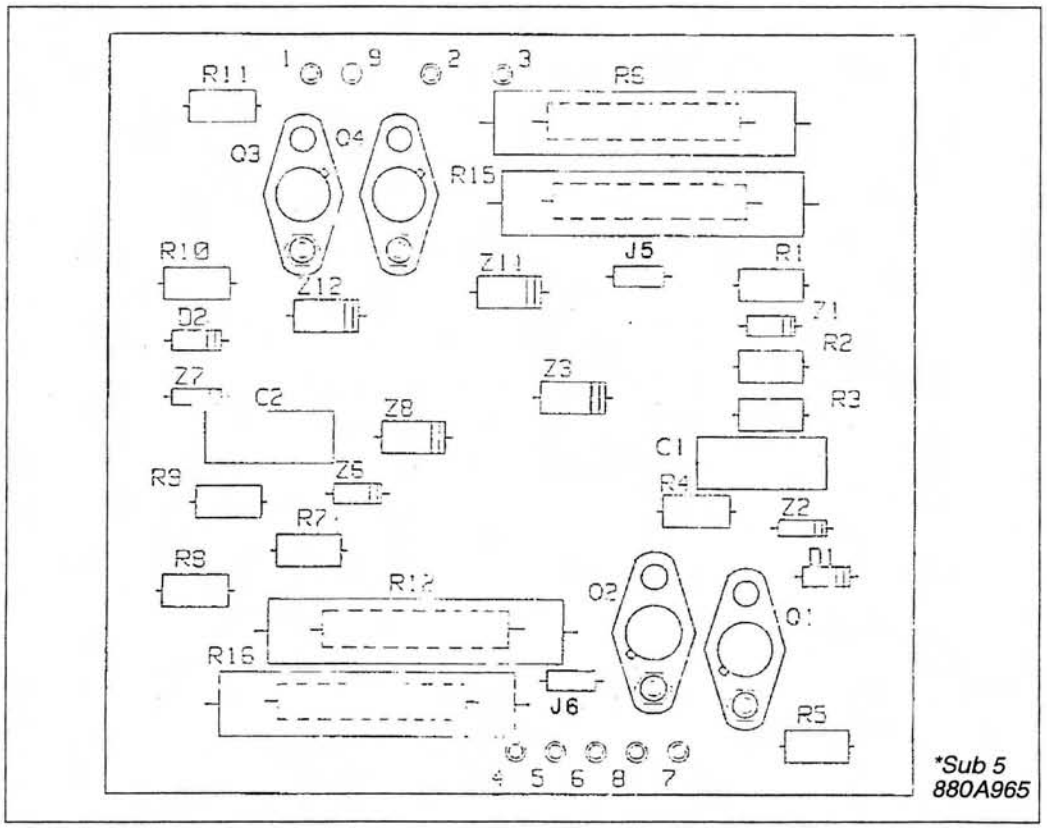



*Figure 23. Component Location*
*2 Single Buffered Inputs in Type FT-22 Case; 28 Vdc.*

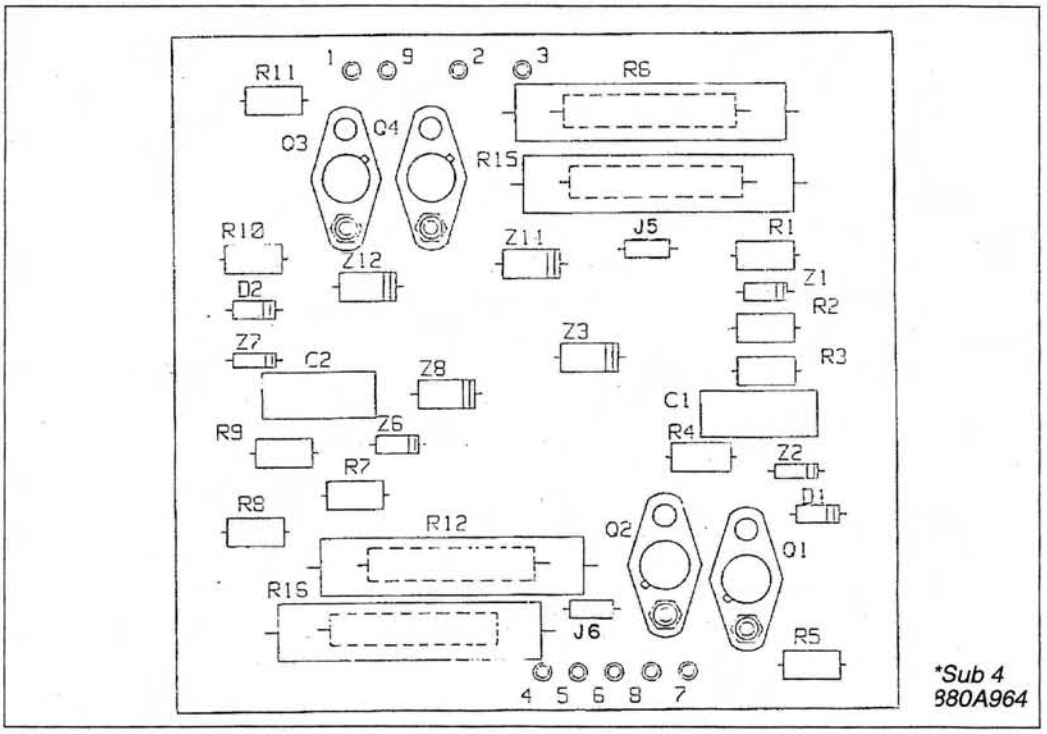



*Figure 24. Component Location*
*2 Single Buffered Inputs in Type FT-22 Case; 125 Vdc.*

** Denotes change since previous issue*

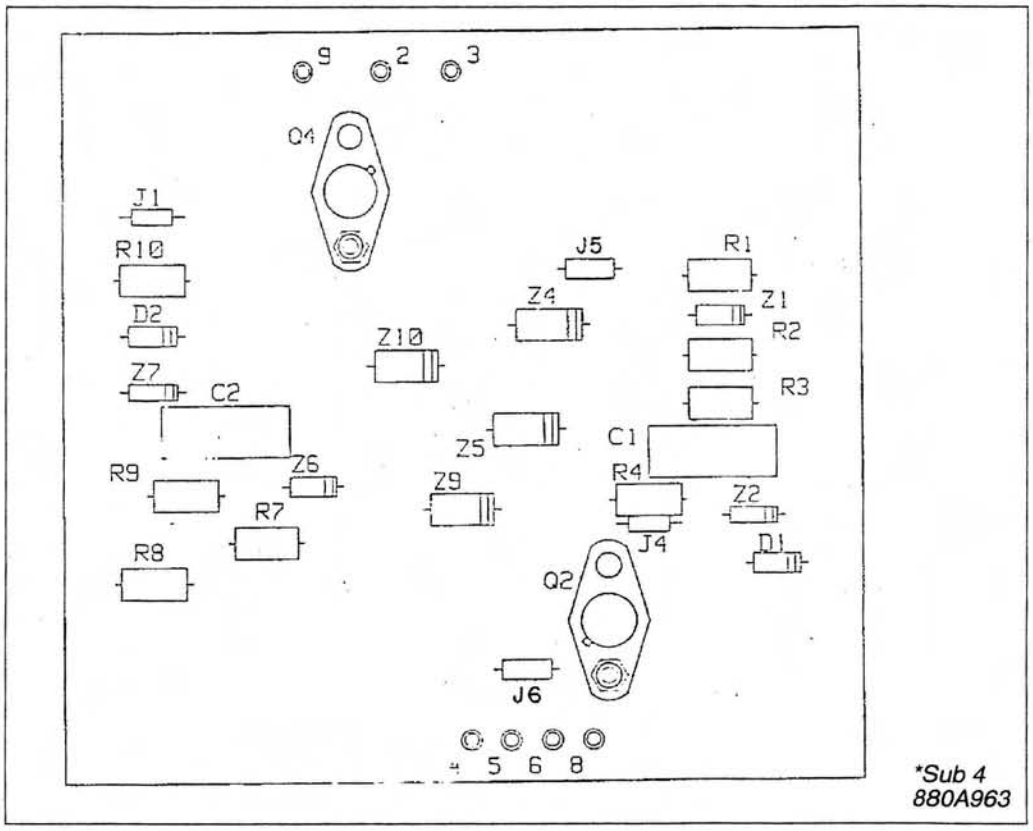



*Figure 25. Component Location*
*2 Single Buffered Inputs in FT-22 Case; 250 Vdc.*

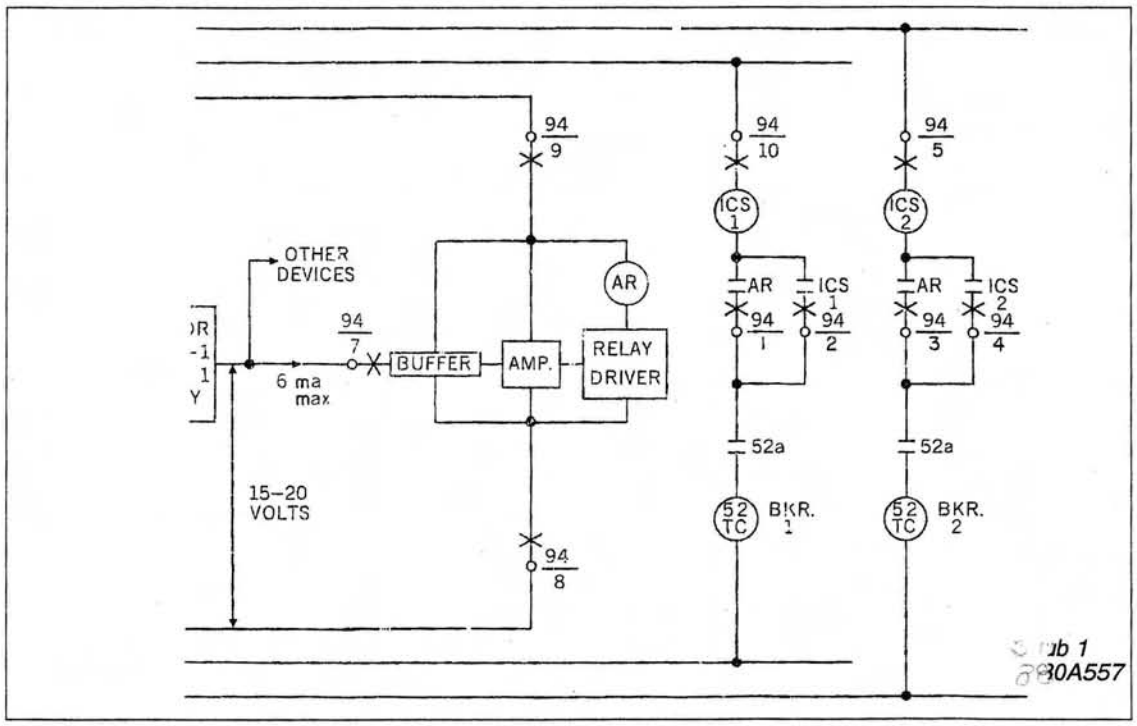



*Figure 26. Typical External Schematic of Relay Type ARS.*

** Denotes change since previous issue*

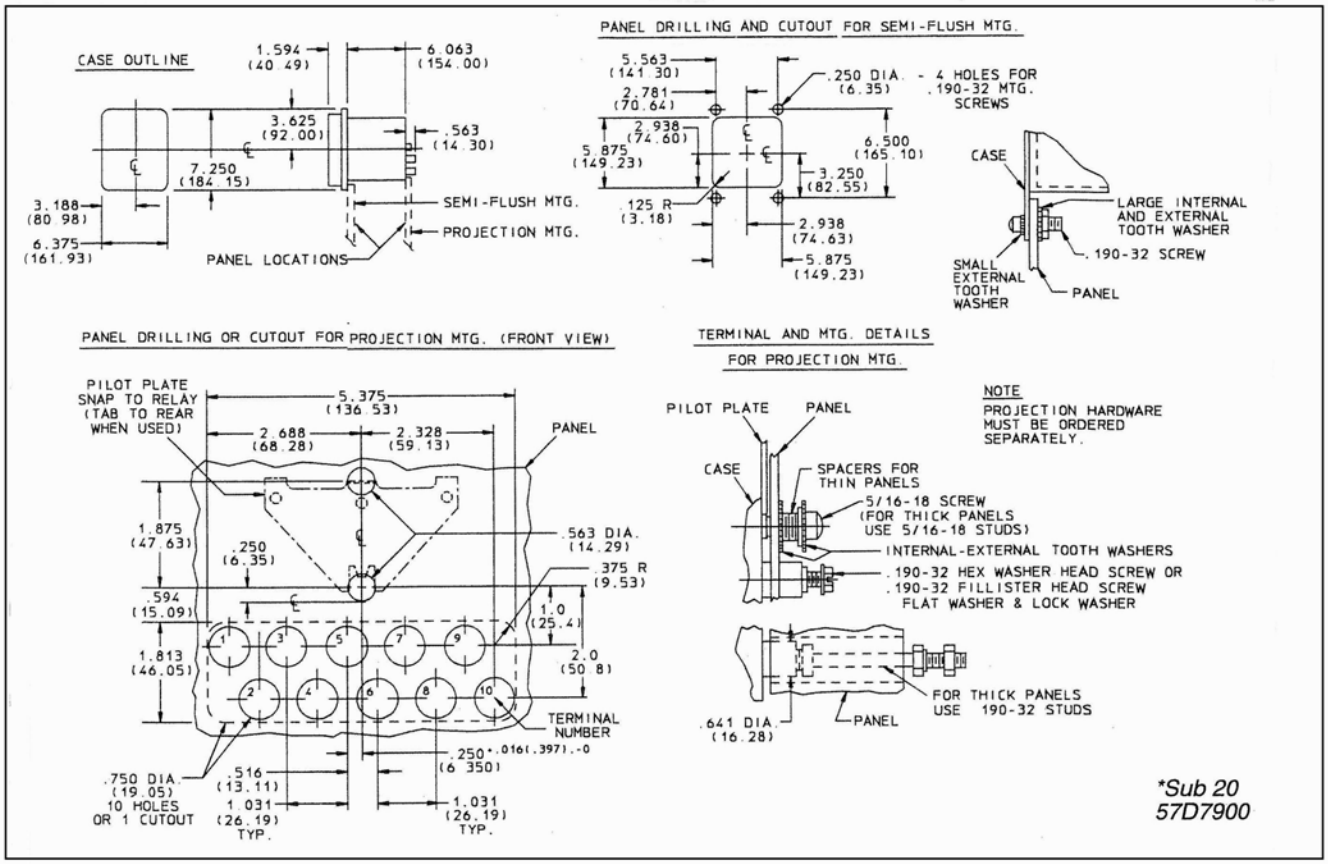



*Figure 27. Outline and Drilling Plan for ARS in FT-11 Case*

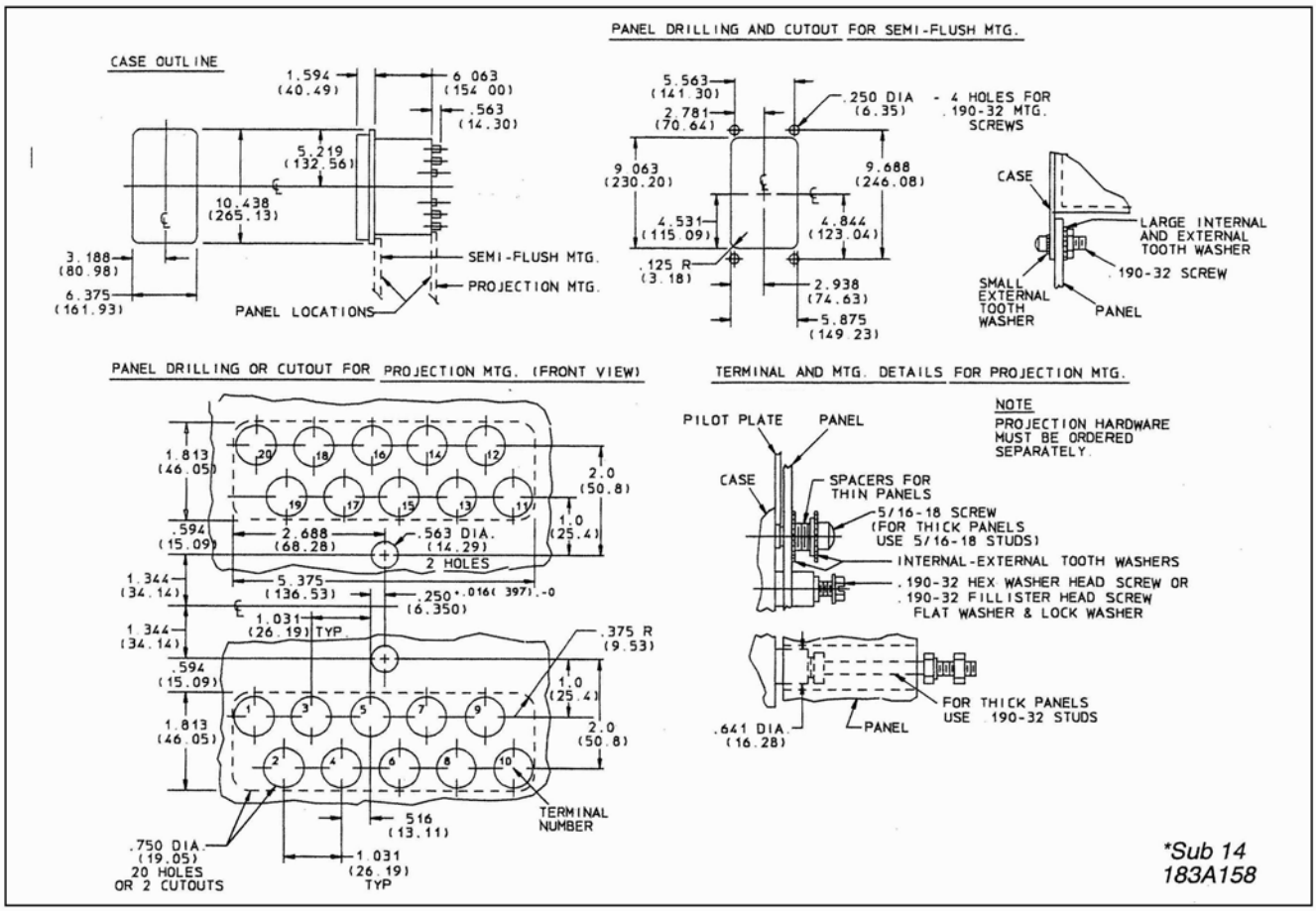



*Figure 28. Outline and Drilling Plan for ARS in FT-22 Case*



** = Denotes change since previous issue.*

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