This is a REPRINT including Changes 1 and 2.

TM 9-4931-456-14-1

TECHNICAL MANUAL

OPERATOR'S ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL:

FLOW TRANSFER KIT, FLOW TECHNOLOGY, INC. MODEL FT-AFS-4-CF AND ANADEX INSTRUMENTS, INC. MODEL CF-604-6-8175Q

HEADQUARTERS, DEPARTMENT OF THE ARMY

SEPTEMBER 1973

TECHNICAL MANUAL
No. 9-4931-456-14-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *28 September 1973*

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST:

FLOW TRANSFER KIT, FLOW TECHNOLOGY MODEL FT-AFS-4-CF MIS 10391 (NSN 4931-00-168-9879)

LIST OF ILLUSTRATIONS

Section I
GENERAL DESCRIPTION

0. INTRODUCTION

0.1. SCOPE

0.2. This manual includes installation and operation instructions and covers organizational, direct support (DS) and general support (GS) maintenance. It describes Flow Transfer Kit, Flow Technology, Inc. Model FT-AFS-4-CF and Anadex Instruments, Inc. Model CF-604-6-8175Q.

0.3. The basic issue items list for this manual is listed in Appendix B.

0.4. INDEXES OF PUBLICATIONS

0.5. *DA Pam, 310-4*. Refer to the latest issue of DA Pam 310-4 to determine if there are any new editions, changes, or additional publications pertaining to the equipment.

0.6. *DA Pam 310-7*. Refer to DA Pam 310-7 to determine whether there are Modification Work Orders (MWO's) pertaining to the equipment.

0.7. FORMS AND RECORDS

0.8. *Reports of Maintenance and Unsatisfactory Equipment.* Use equipment forms and records in accordance with instructions given in TM 38-750.

0.9. *Report of Packaging and Handling Deficiencies*. Fill out and forward DD Form 6 as prescribed in AR 700-58 (Army), NAVSUP Pub 378 Navy), AFR 71-4 (Air Force), and MCO P4030.29 (Marine Corps).

0.10. *Discrepancy in Shipment Report*. Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 (Army), NAVSUP Pub 459 (Navy), AFM 75-34 (Air Force), and MCO P3610.19 (Marine Corps).

0.11. *Reporting of Errors.* The reporting of errors, missions, and recommendations for improving this manual is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications), and forwarded direct to Commander, US Army Missile Command, ATTN: AMSMI-MFM, Redstone Arsenal, AL 35809.

1.0 DESCRIPTION OF FLOW TRANSFER KIT

The Flow Transfer Kit provided under MIS-10391A consists of two cases which contain the flowmeter and flow indicator units and a small shipping case to be used for transporting flowmeters between the using activity and the calibrating agency.

The Flowmeter Kit, Figure 1, contains the flowmeter and accessory equipment to set up the test installation.

-NOTE-

This flow equipment meets hazardous location service requirements provided flow indicator is removed to a safe area.

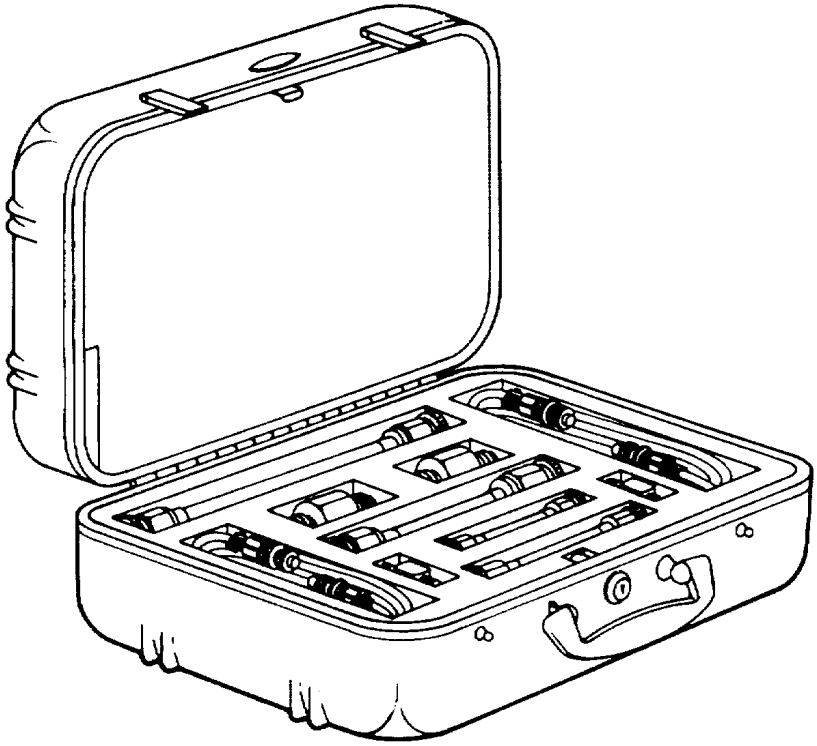


FIGURE 1. FLOWMETER KIT.

The Flow Indicator Case, Figure 2, contains the indicator unit.

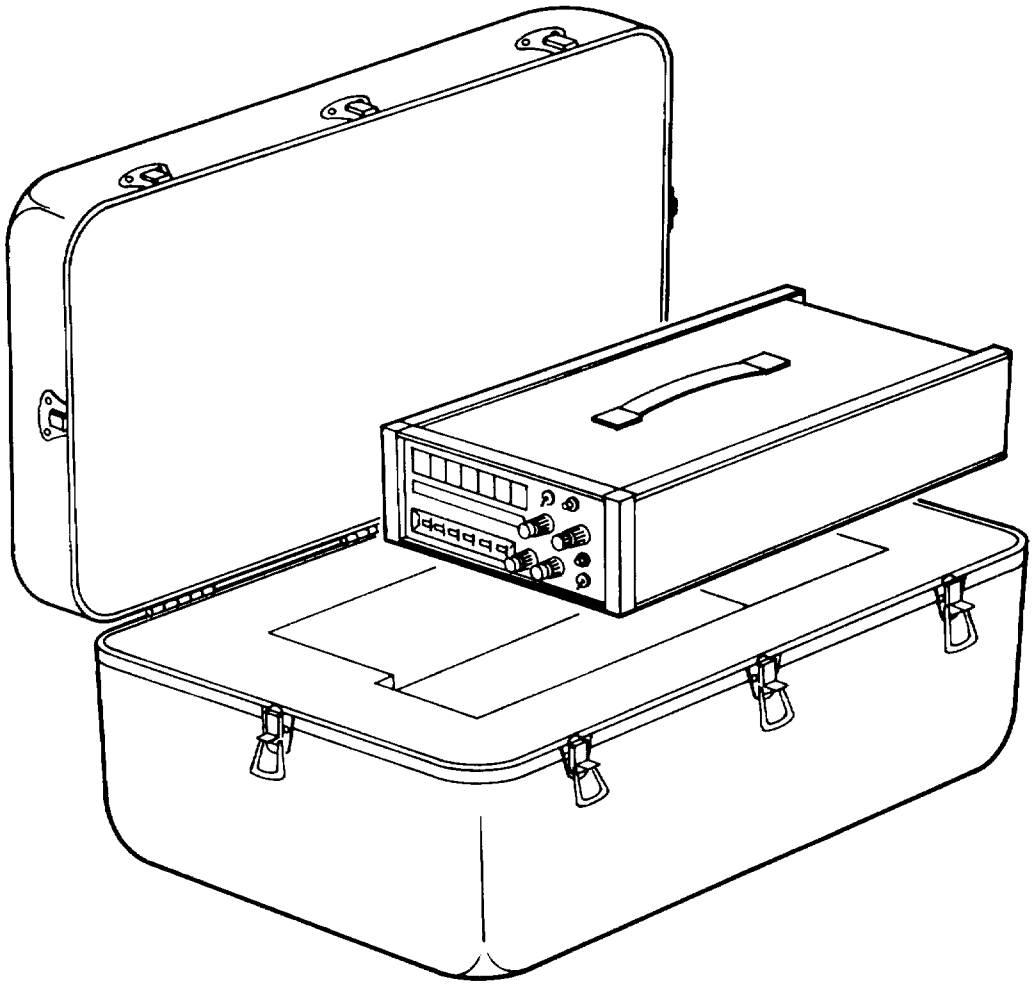


FIGURE 2. FLOW INDICATOR KIT.

1.1 Specifications

NOTE: All of the following specifications are referenced to Missile Command Specification MIS-10391A, dated 1 December 1970 as amended. Paragraph references appear parenthetically at the beginning of each major section.

1.1.1 Flow Indicator - General (3.2.2)

The Flow Indicator is an easily portable instrument designed to provide a digital reading in engineering units for low level AC frequency inputs, primarily those produced by RF type flowmeters. The Flow Indicator contains the necessary power supply for the RF Amplifier-Demodulator contained within the Indicator and has a current limiting resistor to permit safe usage of the RF flowmeter in hazardous areas. The Flow Indicator may also be used with magnetic transducer pickups. A separate selectable input is provided for this purpose. The Flow Indicator contains adequate fuse protection and an LC power line filter to minimize electrical noise pickup from the power line.

1.1.2 Operating Modes (3.2.3, 3.3.6)

Five operating modes are provided plus a REMOTE position for external mode selection.

1.1.2.1 PRESET COUNT

In this mode, the Flow Indicator totalizes the prescaled input signal for the duration of a gate control signal. A prescale factor of 1, 10, 100 or 1000 times the number set into the thumbswitches is available. The gate control signal may be provided by manual actuation of the front panel COUNT ON/OFF switch, the duration of an external solid state or mechanical switch closure or separate or common line start-stop pulses. The prescaled input is totalized and displayed. Accuracy is ±1 count.

1.1.2.2 RATE

This mode allows the display of normalized rate (PPH, GPM, RPM, etc.). The input signal (either Input A or the FLOWMETER input) is counted for a preset gate time interval. The

1.1.2.2 RATE (Cont'd)

gate time interval is selected by the combination of front panel thumbswitches and multiplier. Accuracy is ±1 count ± time base accuracy. Gate times are:

Preset	Multiplier	Gate Time
.000001 to .999999	X1	0.00001 to 9.99999 sec
.000001 to .999999	X10	0.0001 to 99.9999 sec
.000001 to .999999	X100	0.001 to 999.999 sec
.000001 to .999999	X1000	0.01 to 9999.99 sec

1.1.2.3 TIME A

This mode is essentially a multiple period average measurement of either Input A or the FLOWMETER input. The number of periods averaged is selected by the front panel thumbswitches and the clock resolution is selected by the multiplier as follows:

Multiplier	Clock Frequency	Time Increments
X1	100 KHz	10 µsec
X10	10 KHz	100 µsec
X100	1 KHz	1 msec
X1000	100 Hz	10 msec

Accuracy is ±1 count, ± time base accuracy ± trigger error.

1.1.2.4 TIME INT.

This mode allows the unit to measure the duration of a mechanical or solid state switch closure, the time between two momentary external switch closures, the time between two external pulses, or the time between two actuations of a single front panel switch. Clock resolution is again selected by the multiplier switch as in 1.1.2.3. Accuracy is same as TIME A mode.

1.1.2.5 TEST

This mode provides the means for testing the majority of the internal logic circuitry of the Flow Indicator. An internal clock referenced frequency, selected by the Multiplier switch, is substituted for the input frequency. The Flow Indicator is in all other respects essentially in the RATE mode. All readings in the TEST mode must be exact.

1.1.2.6 REMOTE

This position of the function switch transfers control of the mode, thumbswitch and multiplier selection to external means through the REMOTE Connector. All selections are made by either contact closures or TTL/DTL logic "0", i.e.+0.4 V max. current sinking, two TTL loads max.

1.1.3 Controls (3.2.4)

Complete selection of control functions are provided so that the user has complete flexibility in the application of the Flow Indicator per Specification MIS10391A.

1.1.3.1 Function Selector Switch

A six position rotary switch, on the front panel, is provided to allow the user to select any one of the five operating modes or to transfer control to a remote location.

1.1.3.2 Preset Switches

Six decades of thumbswitches are provided on the front panel. A decimal point is indicated at the extreme left, i, e. .XXXXXX.

1.1.3.3 Preset Multiplier

A four position rotary switch on the front panel, with X1, X10, X100 and X1000 capability, as required by Section 1.1.2.

1.1.3.4 RESET Switch

A momentary pushbutton switch on the front panel. Resets all internal circuitry in preparation for a new command. May not reset the display to zero if the Memory

1.1.3.4 RESET Switch (Cont'd)

switch is on. May also be initiated by a remote solid state or mechanical switch closure or by a pulse.

1.1.3.5 COUNT ON/OFF Switch

A momentary pushbutton switch on the front panel. Active in the PRESET COUNT and TIME INT. modes only. The first actuation initiates a gate interval and the second actuation stops the interval.

1.1.3.6 MEM. ON/OFF Switch

A two position toggle switch on the front panel. In the MEM. ON position, the display is updated only at the end of the gate interval. In the off position, the display continuously follows the counting process.

1.1.3.7 DISPLAY TIME

A combination pot/switch control on the front panel. Full CCW (past the detent) is the HOLD position or infinite display time where the last reading is held until an external command (reset) occurs to start a new interval. Full CCW (not past the detent) is MIN. display time, less than 200 milliseconds between samples. Full CW of the control is MAX. display time, greater than 5 seconds between samples.

1.1.3.8 POWER ON/OFF Switch

A two position toggle switch on the front panel which controls all primary power to the instrument.

1.1.3.9 Input Signal Controls

A concentric, independent pot/switch combination on the front panel for the 10 millivolt Input A.

1.1.3.9.1 MULTIPLIER

Essentially an input attenuator which "multiplies" the basic sensitivity of the unit by factors of X1, X10 and X100.

1.1.3.9.2 MULTIPLIER FINE Control

A single turn variable control. Full CCW is the most sensitive position. Full CW is the least sensitive position.

1.1.3.10 Input Selector

A two position toggle switch on the rear panel which selects either the FLOW (RF flowmeter) input or Input A (10 MV RMS input).

1.1.3.11 EXT. T. B./INT. T. B. Switch (3.3.5.3)

A two position toggle switch on the rear panel which selects either the internal 1 MHz crystal clock or an external clock as supplied by the user.

1.1.4 Display (3.2.5)

The front panel display contains all of the items listed in paragraphs 1.1.4.1, 1.1.4.2 and 1.1.4.3.

1.1.4.1 Readout

A six digit in-line numeric display provides an easily read display of the total measurement of the Flow Indicator.

1.1.4.2 Overflow

If overflow occurs, the symbol O/F will be lit in the display window.

1.1.4.3 Gate

The GATE symbol will be lit in the display window whenever the count gate is open.

1.1.5 Outputs (3.2.6)

The outputs listed are all available at the rear panel.

1.1.5.1 Internal Clock

A REF.1 MHz BNC is provided on the rear panel to allow easy monitoring of the internal 1 MHz clock.

1.1.5.2 Amplified Rate Output

An OUT A BNC is provided on the rear panel as a monitor point. The output signal is essentially a square wave of 4.5 V pk-pk minimum from a 500Ω output impedance. The output is available continuously (no reset interruption). The output represents either input A amplified or the FLOW Input amplified whichever is selected by the Input Selector Switch.

1.1.5.3 BCD OUTPUT

A 50 pin connector on the rear panel for driving a printer or associated equipment. The output 1,2,4,8 BCD coded for each digit with an overflow bit. The output is DTL/TTL compatible, positive true. The Print Command is the gate signal (+2.4 V min. to +0.4 V max. at the beginning of the gate interval, +0.4 V max. to +2.4 V min. at the end of the gate interval). The output loading factor is 10 TTL loads.

1.1.6 Flow Indicator Carrying Case (3.2.8)

The Flow Indicator is provided with a carrying case whose combined weight does not exceed 35 pounds. The maximum volume of the carrying case is less than 2.0 cubic feet.

1.1.7 Power Input (3.3.3)

The Flow Indicator will operate from 105 to 130 or 210 to 260 VAC, 50 to 400 Hz, single phase power lines. The unit requires 30 Watts maximum. A rear panel screw driver switch selects the appropriate voltage range. A 3-conductor, 3-prong, detachable AC power cord, approximately 8' long is provided.

1.1.7.1 Warm-up Time

A 30 minute maximum warm-up time is required after power turn on for the unit to reach full operating performance.

1.1.8 Time Base Stability (3.3.4)

1.1.8.1 Aging

Aging rate of the internal crystal oscillator is less than 1 PPM per week.

1.1.8.2 Temperature

Over the temperature range of +4°C to +40°C, the maximum variation in the time base clock frequency is less than ±10 PPM.

1.1.8.3 Line Voltage

±10 per cent change in the line voltage within the range stated in paragraph 1.1.7, causes less than ±1 PPM change in the time base clock frequency.

1.1.9 Flow Indicator Input (3.3.5)

1.1.9.1 Input A

Input sensitivity is better than 0.01 volt RMS (sine wave) or 0.03 volt peak (pulse) on the X1 position of the input attenuator, over the frequency range of 5 Hz to 5 KHz. Input impedance is 100 Kilohms minimum with less than 50 picofarad shunt. Input attenuation factors of 1, 10 and 100 are provided through the Input Multiplier.

1.1.9.1.1 Maximum Allowable Input Voltage

Maximum allowable input voltages without damage to Input A are:

20	Volts pk-pk on X1	position.
200	Volts pk-pk on X10	position.
300	Volts pk-pk on X100	position.

1.1.9.1.2 Trigger Accuracy (TIME A mode)

For a sine wave input, the trigger error for a 60 db signal-to-noise ratio is less than 0.03 per cent/n, where n is the number of periods averaged.

1.1.9.2 REMOTE PROGRAM

A rear mounted 50 pin connector is provided which allows complete programmability of mode selection, and preset thumbswitch and multiplier number. Programming is by means of single line connection in the case of mode and multiplier, and by 1,2,4,8 BCD connections in the case of the thumbswitch number.

1.1.9.3 External Time Base

A rear mounted BNC connector is provided to allow the user to introduce an external frequency within the range of 100 Hz to 1 MHz as the basic time base clock frequency. The sensitivity of the input is better than 1 Volt pk-pk with an input impedance of greater than 1 Kilohm. Maximum input without damage is 10 Volts RMS.

1.1.9.4 CONTROL Connector

The following control functions and connections are provided through the CONTROL connector:

1.1.9.4.1 CHASSIS Ground

Same as earth ground connected to 3rd wire of input power connector.

1.1.9.4.2 COMMON

Internal logic ground.

1.1.9.4.3 EXT. RESET PULSE

Requires a 4 V negative pulse, 0.5 µs minimum duration or 1 µs minimum rise time.

1.1.9.4.4 EXT. RESET SW

Contact closure to COMMON resets the internal logic of the Flow Indicator in an identical manner to the front panel RESET pushbutton.

1.1.9.4.5 EXT. START

DTL/TTL compatible negative going pulse to COMMON initiates a gate interval in PRESET COUNT and TIME INT. modes.

1.1.9.4.6 EXT. STOP

Same as EXT. START except that gate interval is ended. EXT. START and EXT. STOP lines may be connected together for consecutive pulse start-stop action. Automatic reset occurs after display time when these terminals are used.

1.1.9.4.7 GATE SW.

Solid state or mechanical switch closure to COMMON causes the count gate to open and remain open so long as the switch remains closed. Automatic reset does not occur, allowing consecutive accumulations to be made.

1.1.9.4.8 EXT. COUNT ON/OFF

Operates same as front panel switch, i.e. first mechanical switch closure to COMMON initiates a gate interval in PRESET COUNT and TIME INT. modes. Second closure ends the interval. Bounce suppression is provided.

1.1.10 Operation Environment

1.1.10.1 Temperature

The Flow Indicator will operate as specified between temperatures of +4° C minimum to +40° C maximum.

1.1.10.2 Relative Humidity

The Flow Indicator will operate as specified between relative humidities of 0 to 90 per cent.

1.1.10.3 Altitude

The Flow Indicator will operate as specified over the altitude range of 0 to 10,000 feet above sea level.

1.1.11 Non-Operational Environment

The Flow Indicator will withstand the following with no damage:

Storage for 48 hours at minus 55°C.
Storage for 48 hours at plus 60° C.
Storage for 48 hours at 40,000 feet above sea level.

1.1.12 Vibration

The Flow Indicator, in its carrying case, will withstand, without damage, a vibration test with the frequency varying from 5 to 55 Hz at a total excursion of 0.036 ±0.006 inches; the frequency varying uniformly from 5 to 55 Hz and returning to 5 Hz in approximately 5 minutes in each of the three major axes.

1.1.13 Vertical and Lateral Shock

The Flow Indicator, in its carrying case, will withstand, without damage, vertical and lateral shocks of 15 g's for a duration of 11 milliseconds.

1.1.14 Tilt Drop

The Flow Indicator, in its carrying case, will withstand, without damage, a tilt drop test consisting of raising each of the four sides of the carrying case, using the opposite side as a pivot, at least 4 inches above the horizontal plane and allowing it to drop freely onto a solid surface.

1.1.15 Electromagnetic Interference.

The Flow Indicator meets the requirements of MIL-STD-461 and MIL-STD-462.

1.2 Application Note

1.2.1 RATE - Frequency Measurements

The Flow Indicator can be used as a basic frequency counter simply by inserting in the front panel thumbswitches the value of one second or decimal equivalents. The gate time of one second will transcribe the input signal into frequency directly in terms of cycles or pulses per second. A setting of .100000 X1 is one second. One second may also be set by .010000 X10 or .001000 X100 or .000100 X1000. With a one second gate time, the readout displays directly in Hz (XXXXXX Hz). When using settings other than 1 second, care must be exercised to mentally locate the decimal point. Starting from a setting of .010000 X10, the display can be expanded in either direction simply by changing the multiplier (.010000 X1 = XXX.XX KHz and .010000 X100 = XXXX.X Hz). Scaling of frequency readings may be extended to the limits of the time base range. (See Specifications, Section I for limits.)

Normalized Rate

Normalized rate measurements are special cases of frequency measurement. Specific applications include the quantizing and displaying of shaft rotational rates (tachometer) liquid flow rates (turbine flowmeters) and speed indication of production line or conveyor belt systems. The CF-604 features high input sensitivity which is compatible with the direct output of a variety of widely used electromagnetic transducers.

The ability of a counter to vary its time base has greatly extended the usability of rate counters. Proper adjustment of the time base makes possible direct readout in basic engineering units such that troublesome conversions are completely avoided. This ability to read directly also avoids costly errors in calculations and speeds identification of system problems by quick identification. Selecting the proper gate time is the most critical factor in this type of counter. However, once one acquires an understanding of what is occurring within the counter, normalized settings may be derived quite easily.

Normalized rate is accomplished by adjusting the gating interval of the counter so as to sample only that portion of the input signal required to provide the proper display. If we have a sensor, for example, delivering 100 pulses for each revolution of a shaft, then in order to read RPM, we only want to display 1 for every 100 pulses received. With a rotational rate of 1 RPM and a gate time of 1 minute, the counter would obviously display 100.

1.2.1 Normalized Rate (Cont'd)

To achieve a reading of one, the gate time of one minute must be divided by 100. Therefore, in 1/100th of a minute one pulse would be registered by the counter which is the desired value for RPM display. Since the counter gate is designated in seconds, it is necessary to convert the 1/100th of a minute to seconds for proper insertion into the counter i.e., 60/100 seconds or .6 seconds.

The following steps and examples will illustrate the principle in more detail.

Step 1: Determine the K factor or characteristics of the output signal from the sensor or transducer to be used. (Tachometers, for example, deliver N pulses per revolution. Flowmeters typically deliver N pulses per gallon, etc.) Most devices delivering pulses or cycles as a function of rate may be used as inputs and the K factor is given by the manufacturer of the sensor used.

Step 2: Decide on the final engineering units required in the display (RPM, gallons per minute, feet per second, etc.).

Step 3: Convert the time units contained in Step 2 to seconds as all time base calculations must be in seconds for proper counter interpretation. This value then becomes T in the following formula (i. e. RPM and GPM would require a T of 60 to convert minutes to seconds).

Step 4: Determine the time base setting (t) by dividing the K factor into the T found in Step 3, $t = \frac{T}{K}$

Step 5: Insert this number into the thumbswitches. The display will now read directly in the units established in Step 2. Several examples will illustrate the procedure.

Example 1: Reading RPM from a shaft encoder.

Step 1: Tachometer K factor is 60 pulses per revolution.

Step 2: Desired readout is revolutions per minute.

Step 3: RPM requires a conversion factor of 60 to resolve one minute to 60 seconds; therefore, T= 60.

1.2.1 Normalized Rate (Cont'd)

Step 4: $t = \frac{T}{K} = \frac{60}{60} = 1$ sec.

Step 5: Insert .100000 in thumbswitches end X1 on the multiplier. Readings will now be directly in RPM.

Example 2: Reading fluid flow from a flowmeter.

Step 1: Flowmeter delivers 1000 cycles per barrel. K = 1000.

Step 2: Desired readout is barrels per hour.

Step 3: One hour equals 3600 seconds. T - 3600.

Step 4: $t = \frac{T}{K} = \frac{3600}{1000} = 3.6$ sec.

Step 5: Insert .360000 seconds into the thumbswitches and X1 on the multiplier.

If the units of K do not coincide with the units established by Step 2, then it may be necessary make an initial conversion in K.

Example 3: Reading same as Example 2.

Step 1: Same as Example 2. (K = 1000)

Step 2: Desired readout is gallons per minute. Since gallons and barrels are different, K must be converted to cycles per gallon. Since for crude oil 42 gals = 1 barrel, then K becomes $\frac{1000}{42} = 23.810$.

Step 3: One minute results in T = 60.

Step 4: $t = \frac{T}{K} \quad \frac{60}{23.810} = 2.5200$ seconds.

Step 5: Insert .252000 seconds into thumbswitches and X1 on the multiplier.

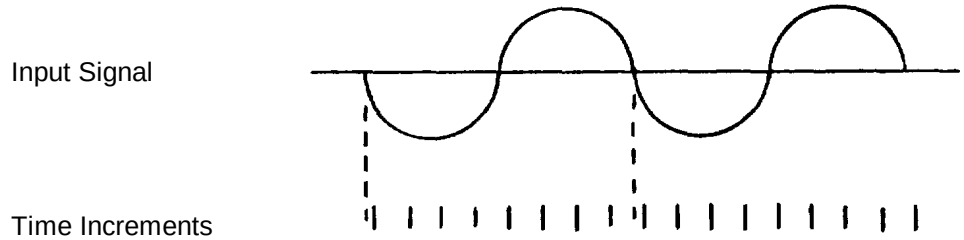
1.2.2 TIME Measurement

Time measurements, as the name implies, utilize the internal clock oscillator of the instrument to provide precise predetermined pulses of such a frequency that, when fed to the totalizer and display section, indicate actual elapsed time (i.e. seconds, milliseconds, microseconds, etc.). Precise starting and stopping of the counting process enables accurate measurements of the time for an event or for the period of repetitive events. The method used for start-stop control depends on the application and may be accomplished in a number of ways as discussed below.

Input Amplifiers

When measuring periods of repetitive waveforms or time intervals between low level signals, the amplified input (Input A) should be used. This input has selectable gain and provides for operation over a wide range of input signal levels.

When using Input A, the counter will start and stop the count cycle on consecutive waveforms or after a selected number of waveforms. The figure below pictorializes what is taking place.



Eight pulses transpired during one cycle of Input A or the time required for one cycle was eighty microseconds. When the input waveform is sinusoidal in nature, the measurement mode is usually referred to as a Period Measurement.

The accuracy of time readings may be improved by averaging a number of readings. For this reason, most counters have multiple period selection (i.e. 1, 10 and 100 periods) or where preset thumbswitches are included, any number of periods may be selected depending upon the setting on the thumbswitches. When multiple periods are used, it must be remembered to divide the resultant readings by the number of periods selected to arrive at the actual time for one period (period average).

1.2.2 TIME Measurement (Cont'd)

Mechanical or Solid State Switch Closure

The time interval between events can be examined when these events are represented by mechanical or solid state switch closure. This is especially valuable in determining the time for mechanical phenomena such as contact closures or certain process controls. Additional versatility is provided when measurements are made using these input signals in that the counter does not reset automatically at the end of the process. Unless reset is initiated manually or remotely, the counter will sum the time for consecutive intervals.

Pulse Inputs

When the time interval to be measured is represented by discrete pulses, it is frequently desirable to have separate start and stop command inputs. A trigger from one sensor can be used to start the count and a trigger from a different sensor can be used to stop the count. Consecutive pulses on a single line may also be accommodated.

Time Increment

The proper selection of time increment depends to a great extent upon a particular application. When the period under investigation is of long duration, short time increments may tend to overflow the capacity of the counter. The CF-604 provides for time increments of 10, 100, 1000 microseconds and 10 milliseconds and the time increment should be chosen for maximum resolution without exceeding the capacity of the display.

It is advisable in precision measurements of time interval to examine the input waveform prior to taking measurements in order to optimize the techniques used.

Time for "N" Events

The presence of a variable selector greatly extends the utility of the time measurement counter. Any number of periods (within the range of the switch settings) may be counted in order to provide greater accuracy. This same technique may be applied to the measurement of time interval between events. When multiple events are surveyed, the expression is titled, "Time for N events". The time for N events function is useful in the nuclear field and other similar applications where it is necessary to register time for the accumulation of a predetermined number of random or periodic pulses.

1.2.3 PRESET COUNT

PRESET COUNT is a specialized form of totalizing possible only when the counter includes a prescale system. In this mode, the input signal is fed to the Decade Counters associated with the thumbwheel and multiplier switches and, therefore, this input is prescaled (divided) by the number established by these switches. Only one pulse is registered and displayed by the display each time the number of input pulses equals the setting in the thumbswitches (thumbswitch decimal point is ignored in this mode). The number designated by the thumbswitches is termed PRESET or BATCH and, therefore, the number displayed by the counter is the number of batches rather than the total accumulated number of input pulses. The multiplier toggle switch should always be placed in the X1 position unless it is necessary to expand the maximum capacity of the thumbswitch settings.

The PRESET COUNT mode is particularly valuable in the process control field and where it is necessary to totalize in terms of engineering units such as Gallons, Barrels, Pounds, etc. By setting the thumbswitches to the appropriate “K” factor, the instrument will accumulate typically in Barrels, etc.

1.2.4 TEST

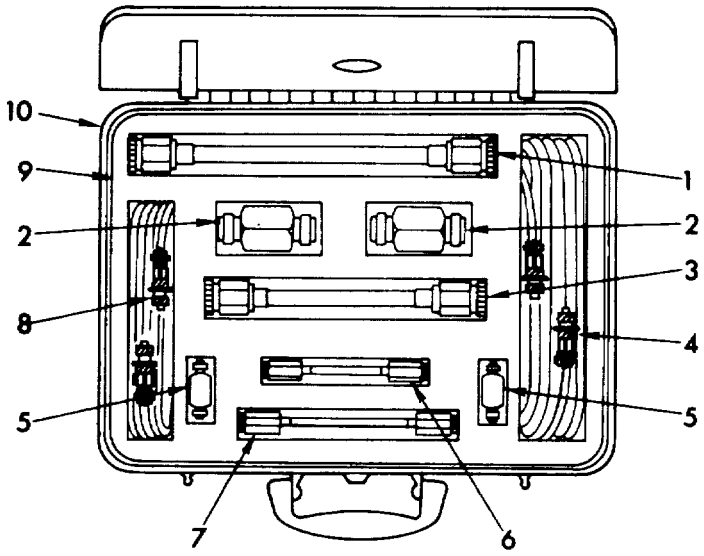
This unit includes a self-check mode. It is a handy means by which the gating controls, thumbswitches and display decades may be checked.

1.2.5 REMOTE

This unit is equipped with Remote Programming for added versatility. All functions, thumbswitches and multiplier may be remotely determined when required, by setting the front panel selector to REMOTE.

1.3 FLOWMETER KIT DESCRIPTION

The Flowmeter Kit contains transducers and piping for both 1/2" and 1" size test setups and cable assemblies allowing for readouts at 50 or 150 feet. Figure 3 shows kit and component parts.



ITEM	NAME	P/N	MFGR.CODE
1	1" UPSTREAM FLOW STRAIGHTENER	11740	18316
2	1" TURBINE FLOWMETER MODEL FT-16M50-LB	31203	18316
3	1" DOWNSTREAM FLOW STRAIGHTENER	11741	18316
4	CABLE AND CONNECTORS, 150 FOOT	C11744	18316
5	1/2" TURBINE FLOWMETER MODEL FT-8M10-LB	31202	18316
6	1/2" DOWNSTREAM FLOW STRAIGHTENER	11742	18316
7	1/2" UPSTREAM FLOW STRAIGHTENER	11743	18316
8	CABLE AND CONNECTORS, 50 FOOT	C11745	18316
9	PACKING	SR 7426	98376
10	ALUMINUM CASE	SR 7426	98376
	TRANSDUCER SHIPPING CASE	ZC-5030	98376

FIGURE 3. FLOWMETER PARTS LAYOUT.

1.4 MIS-10391A SPECIFICATIONS

PARAGRAPH NO.	ITEM	REQUIREMENTS
3.2.7.1	FLOWMETER RANGE	1/2" Meter 1.0 - 10 GPM: 1" Meter 3 - 50 GPM
3.2.7.2	FLOWMETER OUTPUT FREQUENCY	Min. Output of 1800 Cycles per sec under 3.2.7.1 Flow Rates
3.2.7.3	FLOW RANGE	1.0 to 50 GPM
3.2.7.4	VISCOSITY RANGE	Viscosity Range of 0.5 to 30 Centistokes (cs)
3.2.7.5	PRESSURE RANGE	10 to 2500 PSI
3.2.7.7	PRESSURE DROP	Less than 10 PSID at Maximum Flow Rating and 30 CS
3.2.7.8	TEMPERATURE RANGE	50 - 150 Degrees Fahrenheit

WARNING

WATER IS NOT AN ACCEPTABLE FLUID FOR USE WITH THIS FLOW TRANSFER KIT

1.5 GENERAL

The turbine type flow transducer is a volumetric fluid flow measuring instrument. It uses as its flow sensitive element a Freely suspended bladed rotor, positioned axially in line with the flowing fluid, so that it rotates in precise proportion to the volume of fluid passing through the transducer. An "active" type pick-off is placed in close proximity to the turning rotor. A high frequency signal from an oscillator-amplifier is fed into the pick-off coil and the spinning rotor modulates the signal as each blade of the rotor passes the coil. The signal is then de-modulated, amplified, and shaped to a 10 volt positive pulse. The frequency of these pulses represents the volumetric flow rate and the accumulated pulse represents the total volume of fluid measured.

The flowmeter consists of four (4) basic parts (See Figure 4):

1. Housing
2. Rotor Assembly
3. Support Assembly
4. Pick-off and Lock Nut Assembly

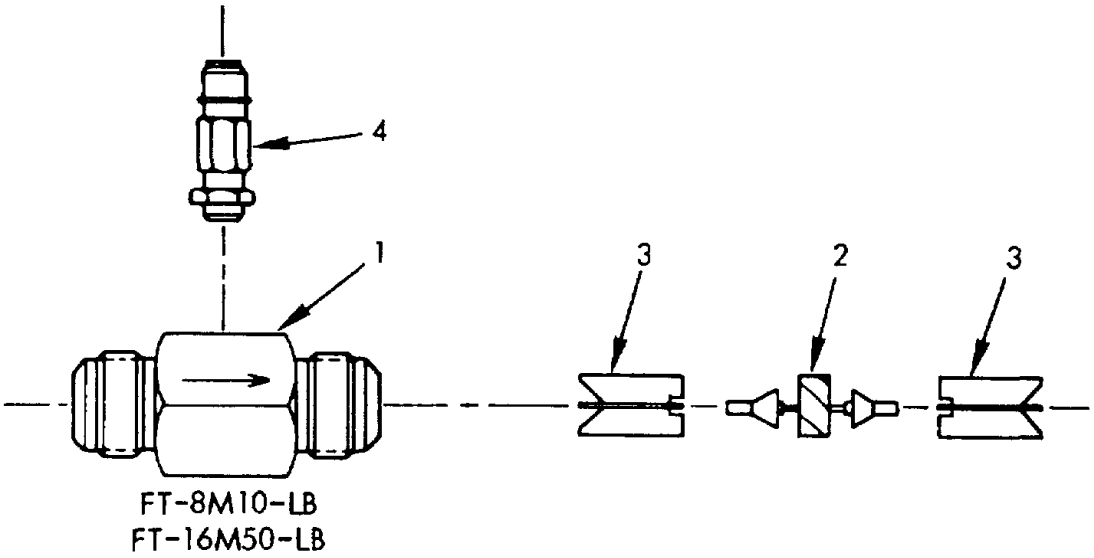


FIGURE 4. GENERAL CONFIGURATION FLOWMETER.

1.6 PICKOFF AND ELECTRICAL CONNECTIONS

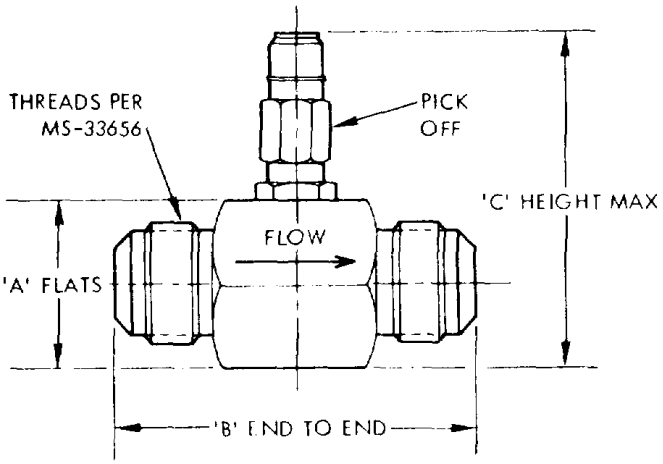
The pick-off connector is the AN dual contact type, MS3106A-10OSL-4P. Mating connectors and two (2) different lengths of cable (50 feet and 150 feet) are supplied with the flowmeter kit. The mating cable connector at the flowmeter is an MS3102A-10SL-4S (See Figure 9).

1.7 END CONNECTIONS

End connections of the flowmeter kit are ground threads conforming to MS33656-8 and -16. Flow direction is deeply etched on the respective housing.

Straightening sections are provided with transfer kit FT-AFS-4-CF with upstream and downstream sections marked as to orientation.

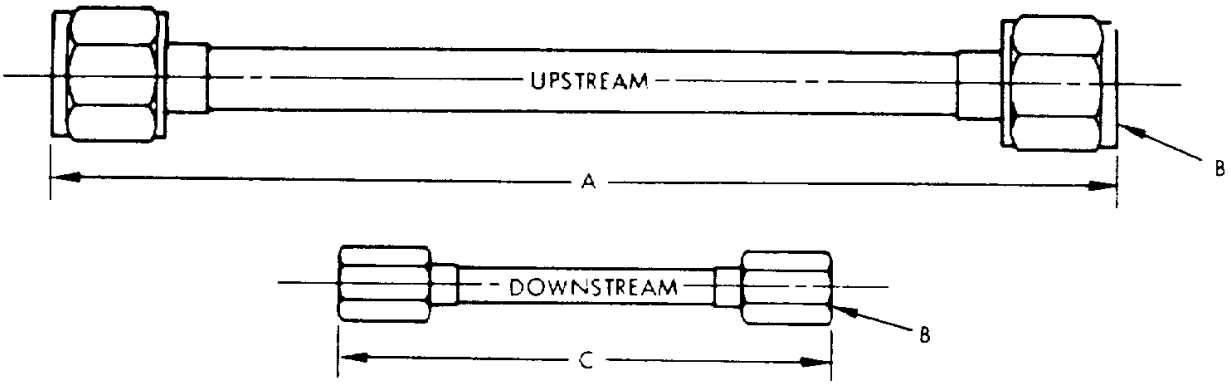
1.8 FLOWMETER DIMENSIONS



SIZE & MODEL	A	B	C
½" FT-8M	1" Sq.	2.40	3
1" FT-16M	1 5/8	3.56	3 1/2

FIGURE 5.

1.9 STRAIGHTEN ER SPECIFICATIONS



SIZE	A	B AN818	C
1/2"	6"	-8	4"
1"	12"	-16	8"

FIGURE 6.

1.10 CASE SPECIFICATIONS

I. Dimensions

A. Length 18 Inches

B. Width 13 Inches

C. Height 6 Inches

II. Materials

A. Packing 2# density polyurethane foam

B. Case Aluminum anodized

C. Latch 2 chrome plated

D. Lock Tumbler type

III. Test Specifications

A. Meets specifications of MIS-10391A Paragraph 3.4

1.11 MATERIALS

PART	STAINLESS	FINISH
Housing	303	Passivate
Retainers	302	Passivate
Supports	303	Passivate
Cones	303	Passivate
Shaft	303	Passivate
Bearing	440-C	None
Turbine	430-F	Glass bead hone & passivate
Spacers	303	Passivate
Pick-offs	303	Passivate
Lock-Nut	303	Passivate
Straighteners	304	Glass bead hone & passivate

1.12 TORQUE

Recommended wrench torques for tightening MS33652 and 10056 flared tube connections in foot pounds.

1/2"	27 Min.	40 Max.
1"	10 Min.	120 Max.

Section II

INSTALLATION

2.1 Physical

Outline dimensions for the unit are shown on drawing #0100-5097-01 contained in Section IV. The counter is designed to be easily portable and is supplied via shock absorbing carrying case.

2.1.1 Bench Use

A tilt bar on the bottom cover snaps out and locks in place to facilitate viewing the readout when the unit is resting on a bench or table.

2.1.2 Ventilation

Proper operation in severe environments necessitates proper air circulation around the unit to keep the ambient temperature below the limit specified.

2.2 Electrical

Power ratings are included in the Specifications in Section I.

2.2.1 Power Connection

The counter is supplied with a switch which selects operation from either 115 VAC or 230 VAC operation. For 230 V operation, reduce power fuse to a value one-half the value rated for 115 V operation.

2.2.2 Power Connector

The counter is supplied with a separate detachable cord with three prong grounded power connectors.

2.2.3 Signal Connections

All signal connections are available at the rear of the unit. See Dwg. #0100-5097-01 for specific details.

2.2.4 System Ground

This unit has the CHASSIS (earth ground) and the COMMON terminal connected (AC-wise) together through a capacitor. The shell of input BNC connector(s) is permanently connected internally to circuit COMMON. For this reason, the maximum allowable voltage (AC or DC) between CHASSIS and COMMON is 200 V.

Section III

OPERATION

3.1 Capabilities

The Anadex Model CF-604-6-8175Q, Flow Indicator, has widespread versatility and may be operated in any of the following modes: RATE (Frequency), TIME A (Period), TIME (EXT) PRESET COUNT and REMOTE control. To assist in determining which mode to use, Section 1.2 of this manual contains typical applications for each operational mode.

3.2 Mode Selection

3.2.1 Mode Selector Switch

The Mode Selector Switch setting determines the operational function of the counter. There is a position for each of the modes mentioned in paragraph 3.1 and in addition a setting is included for TEST. Each of the paragraphs in Section 3.3 discusses a particular mode of operation in detail.

3.2.2 INPUT A MULTIPLIER

The INPUT A MULTIPLIER consists of a three position input signal attenuator (X1, X10, X100) and a concentric FINE vernier control. Before operating the counter in any of the selected ranges, check the specifications, Section I, for maximum allowable signals. Usually it is desirable to operate with the highest possible sensitivity (X1 or X10) within the limitations of maximum allowable signal level. However, when the input signal contains unwanted noise, it is sometimes necessary to decrease sensitivity.

3.3 Operational Modes

Check Section I of this manual for details on when to use specific modes and their accuracy limitations.

3.3.1 RATE (Frequency) Measurements

Frequency and Rate are synonymous terms for this mode of operation where actual measurement is of repetition rate, cycles or frequency per unit of time. Fold out Dwg. #0100-5097-01 for assistance in determining control and terminal locations.

3.3.1 RATE (Frequency) Measurements (Cont'd)

A. Readout

The frequency mode of operation displays the count of the input signal repetitions measured over the gate time. The selection of the proper gate time (see applications Section I) therefore enables displaying directly in Hz, KHz or by use of normalizing techniques, any desired engineering units (i.e. RPM, Ft/sec., etc.). Because of the variety of display units possible, there is no automatic decimal point in this display and the proper location for the decimal point must be determined by the operator (see paragraph 3.2.2 for examples).

B. Gate Time Setting

The thumbswitches and multiplier (X1, X10, X100 and X1000) determine the duration of the counting gate. The gate time is always in seconds as indicated below. The multiplier merely serves to move the decimal point for extending the range of values. For example, when measuring frequency directly, it is desirable to have the time base set for one second or decimal factors of one second, as readings are then directly in Hz. Typical settings are as follows:

Thumbswitch	Multiplier	Display	Gate Time
.100000	X1	XXXXXX Hz	1 sec
.100000	X10	XXXXX.X Hz	10 sec
.100000	X100	XXXX.XX Hz	100 sec
.100000	X1000	XXX.XXX Hz	1000 sec
.010000	X1	XXXX.XX KHz	.1 sec
.010000	X10	XXXXXX Hz	1 sec
.010000	X100	XXXXX.X Hz	10 sec
.010000	X1000	XXXX.XX Hz	100 sec
.001000	X1	XXXXX.X KHz	.01 sec
.001000	X10	XXXX.XX KHz	.1 sec
.001000	X100	XXXXXX Hz	1 sec
.001000	X1000	XXXXX.X Hz	10 sec
.000100	X1	XXX.XXX MHz	.001 sec
.000100	X10	XXXXX.X KHz	.01 sec
.000100	X100	XXXX.XX KHz	.1 sec
.000100	X1000	XXXXX Hz	1 sec

3.3.1 (Cont'd)

B. Gate Time Setting (Cont'd)

The decimal point in the display is implied and not displayed as its location depends upon the units selected. Care must be taken to note its proper location in taking measurements.

Identical scaling techniques are applicable when normalized engineering units are displayed. (See Applications Section I for other examples of normalized time base settings.)

Thumbswitch	Multiplier	Readout
.036000	X1	XXXXX.X 100 barrels/hr
.036000	X10	XXXXXX barrels/hr
.036000	X100	XXXXX.X barrels/hr
.036000	X1000	XXXX.XX barrels/hr

The general rule for scaling is: move thumbswitch setting one column to the left move readout decimal point one column to the left. Increase multiplier one decade move readout decimal point one column to the left.

C. Other Front Panel Controls

POWER Switch - Controls all AC power to the instrument.

RESET Pushbutton - Depression of the RESET button will return display to zero and resets counting gate regardless of cycle condition. (NOTE: Display will not reset to zero in MEM. ON condition if GATE is not open.) DISPLAY TIME Control Adjust for desired time setting. At conclusion of display, reset occurs and a new count cycle is repeated automatically. When in HOLD position, only one reading will be taken and reset must be actuated manually or by remote methods in order to initiate a new count cycle.

MEM. (Memory) Switch - Engages (ON) or disengages (OFF), the memory logic. When in ON position, the display is updated automatically at the end of each count cycle. In OFF, the display follows the counting process.

3.3.1 (Cont'd)

C. Other Front Panel Controls (Cont'd)

COUNT ON/OFF Switch - Not used in this mode.

D. Rear Panel Connections

A (BNC) - The input signal for input A rate measurements is applied to this connector.

FLOWMETER - Input connector for RF flowmeter. Flow measurement signal is applied to this connector.

REF. 1 MHz BNC - Test point for calibration of internal oscillator.

CONTROL Connector - Provides a means for external actuation of gating and reset functions. Specific descriptions follow.

CHASSIS and COMMON Pins - See Section II.

EXT. RESET SW or PULSE Pins - Provide for external reset as required. The SW terminal requires mechanical or solid state closure to COMMON. Must conduct 3 MA maximum with no more than +0.4 V drop. The PULSE terminal is for pulse signals. (See Section I for specification requirements.) GATE-SW Pin Not used in this mode.

EXT. START-STOP Pins - Not used in this mode.

E. Rear Panel Controls

A/FLOW Switch - Allows the operator to select either Input A to be measured, or the FLOW input (RF Flowmeter) to be measured.

EXT. T. B./INT. T. B. Switch - Allows the operator to select either the internal 1 MHz crystal or an external source of up to 1 MHz.

3.3.2 TIME-A (Interval) Measurements

A. Readout - The display for all conditions in the TIME-A mode is in actual units of time (i.e., seconds, microseconds, etc.). The specific units and implied decimal point location are a function of the multiplier switch setting as defined in paragraph C below.

B. Thumbswitches (Period Selection) - In the TIME-A mode, the thumbswitches serve to select the number of cycles, periods, or "N" events of the input signal over which the time base oscillator will be counted. For example, a thumbswitch setting of .000355 means that the readout will show the total number of internal clock pulses that have been accumulated during 355 cycles of the input signal. Note that the front panel decimal point is ignored in this mode. For single period measurements, the thumbswitches should be set to 1 (actual setting of .000001). For multiple or average period measurements, the thumbswitches are usually set in decade multiples, 10, 100, 1000, etc. The total range of periods is from 1 to 1,000,000. To arrive at the time for one period, the number shown on the display must be divided by the thumbswitch setting.

C. Multiplier (Time Resolution)

The multiplier switch selects the internally generated clock frequency counted in this mode and, therefore, determines the resolution of displayed time.

Toggle Switch Setting	Clock Frequency	Time Increment	
X1	100 KHz	10 µs	XXXXX.X µsec
X10	10 KHz	100 µs	XXXX.XX µsec
X100	1 KHz	1000 µs	XXXXXX msec
X1000	100 Hz	10 ms	XXXX.XX sec

Therefore, each count appearing on the readout indicates a time lapse of 10 µsec, 100 µsec, 1000 µsec or 10 msec. depending upon the setting. The location for decimal points, when reading the display, must be mentally noted similar to those shown in the table.

3.3.2 (Cont'd)

D. Other Front Panel Controls

POWER Switch - See Section 3.3.1,C.

RESET Pushbutton - See Section 3.3.1, C.

DISPLAY TIME Control - See Section 3.3.1,C.

INPUT MULTIPLIER - See Section 3.2.2 above.

MEM. SW - Engages (ON) or disengages (OFF), the memory logic. In ON position, the display is updated automatically at the end of each count cycle ONLY, when in the particular operating mode reset also occurs automatically. Switch must be in OFF when gating is by START-STOP SW or STARTSTOP DC control signals as described above. In OFF, the display continually follows the counting process.

COUNT ON/OFF Switch - Not used in this mode.

E. Rear Panel Connections

A (BNC) - The input signal for some of the TIME measurement modes is applied to this connector.

FLOWMETER Conn. - Not normally used in this mode.

REF.1 MHz BNC - Test point for calibration of internal oscillator.

CONTROL Connector - See Section 3.3.1,D.

EXT. RESET SW or PULSE Pins - See Section 3.3.1, D.

F. Rear Panel Controls

A/FLOW Switch - See Section 3.3.1,E. Not normally used in this mode.

EXT. T. B./INT. T. B. Switch - See Section 3.3.1,E.

3.3.3 TIME-EXT. (Interval) Measurements

This mode allows measurement of phenomena such as DC level changes, switch closures and pulse to pulse spacings which would more easily be applied to the rear CONTROL connector. NOTE: All of Section 3.3.2 applies except para.3.3.2B.

A. Front Panel Controls

POWER SW. - See Section 3.3.1, C.

RESET Pushbutton - See Section 3.3.1,C.

3.3.3 (Cont'd)

A. Front Panel Controls (Cont'd)

DISPLAY TIME Control - See Section 3.3.1,C.

INPUT MULTIPLIER - Not used in this mode.

COUNT ON/OFF Switch - This pushbutton switch can be used to control the count accumulation process. One depression of the switch opens the GATE and starts the process. A second depression closes the GATE and stops the process. In this way, the unit can be used as a digital "stop-watch".

MEM. SW - See Section 3.3.2, D. This control is normally to the "off" position in this mode.

MULTIPLIER (Time Resolution) - See Section 3.3.2,C.

B. Rear Panel Connections

A (BNC) - Not used in this mode.

FLOWMETER Connector - Not used in this mode.

CONTROL Connector - See Section 3.3.1, D.

GATE-SW Pin - The counter will count the selected internal clock frequency when this pin is connected to COMMON and stop counting when the connection is open. These two terminals may be connected together remotely by mechanical contacts or by a solid state switch. A solid state switch must be capable of conducting 3 MA maximum with a voltage drop of +0.4 V maximum. Counter does not reset automatically in this mode and unless the reset process is initiated manually or remotely, successive time intervals will be summed.

EXT. STOP and START Pins - Provides for control of start and stop of the counting interval. Counter will totalize the selected internal clock frequency from the receipt of a start pulse at the START pin until the receipt of a similar pulse at the STOP pin. Where single line control is used, the pins may be tied together and counter will start and stop on consecutive pulses. Separate contact closures may be used for start and stop control on these pins. The contact closures should be to COMMON. Bounce protection is inherent. Reset occurs automatically at the end of display time.

3.3.3 (Cont'd)

B. Rear Panel Connections (Cont'd)

EXT. COUNT ON/OFF - Consecutive contact closures may be used on this line to start and stop the GATE interval. Contact closures should be made to COMMON. Bounce protection is provided. Reset occurs automatically at the end of display time.

C. Rear Panel Controls

A/FLOW Switch - Not used in this mode.

EXT. T. B./INT. T. B. Switch - See Section 3.3.1, E.

3.3.4 TEST

With the selector switch in the TEST mode, the counter accumulates counts at a selected rate for the duration determined by the setting of the thumbwheel switches.

A. Readout

The TEST mode of operation displays the number of repetitive occurrences of an internally generated signal accumulated over the duration of the gate time set in the thumbwheel switches. Reset occurs automatically at the end of the cycle and a new count begins. (See DISPLAY TIME Control below.)

B. Test Frequency Selection

This is accomplished only by the front panel multiplier switch (X1, X10, X1000). The count frequencies for the various positions are:

X1	100 KHz
X10	10 KHz
X100	1 KHz
X1000	100 Hz

C. Other Front Panel Controls

RESET Pushbutton - See Section 3.3.1, C.

DISPLAY TIME CONTROL - Adjust for desired time setting. At conclusion of display, reset occurs automatically and the internal logic is prepared to accept a new start pulse. When in HOLD position, only one reading will be taken and reset must be actuated manually or by remote methods in order to prepare for a new count cycle.

3.3.4 (Cont'd)

C. Other Front Panel Controls (Cont'd)

INPUT MULTIPLIER - See Section 3.2.2 above.

MEM. SW - See Section 3.3.1, C.

COUNT ON/OFF Switch - Not used in this mode.

D. Rear Panel Connections

A (BNC) - Not used in this mode.

FLOWMETER Connector - Not used in this mode.

CONTROL Connector - See Section 3.3.1, D.

EXT. RESET SW or PULSE Pins - Provided for external reset as required. The SW terminal is for mechanical or solid state closure to COMMON with a current requirement of 3 MA maximum and a voltage drop of +0.4 V maximum. The PULSE terminal is for reset by a negative pulse. See Section I for specification requirements.

GATE-SW Pin - Not used in this mode.

EXT. START Pin - Not used in this mode.

EXT. STOP Pin - Not used in this mode.

E. Rear Panel Controls

A/FLOW Switch - Not used in this mode.

EXT. T. B./INT. T. B. Switch - See Section 3.3.1,E.

3.3.5 PRESET COUNT

The PRESET COUNT mode of operation is actually a variation of a totalize mode. The input signal is not fed directly to the totalizer and displayed as in a totalize mode, but is first prescaled (divided) by the combined capacities of the thumbswitch preset system and the three-position multiplier toggle switch. This prescaled input is then totalized and displayed by the counter. Control of the counting process in this mode is identical to that for the TIME-EXT. (Interval) mode.

3.3.5 (Cont'd)

A. Readout

The readout displays the accumulated number of coincidences between the input signal and the - PRESET COUNT size setting of the front panel switches.

The number displayed, therefore, represents the number of groups (or batches) of the input signal that have been accumulated within the counting period.

B. PRESET COUNT Size (Prescale)

The following describes the front panel switch settings and the corresponding prescale ranges. Note that the thumbswitch decimal point is ignored in this mode. The multiplier toggle switch should always be placed in the X1 position unless it is necessary to expand the maximum capacity of the thumbswitches by the additional factors of X10, X100 or X1000.

Toggle Sw. Setting	Thumbswitch Setting	Total Prescale (Divisor)
X1	.000001 to .000000	1 to 1,000,000
X10	.000001 to .000000	(1 to 1,000,000) X 10
X100	.000001 to .000000	(1 to 1,000,000) X 100
X1000	.000001 to .000000	(1 to 1,000,000) X 1000

An output pulse is generated each time the number of input pulses applied equals the total prescale factor established by the thumbswitch setting and the toggle switch position. This pulse train represents the number of preset counts (batches) accumulated by the counter and is the signal counted by the totalizer section.

C. Other Front Panel Controls

The setting for all controls other than those described above is identical to that described for the TIME-EXT. (Interval) mode (see Section 3.3.3).

D. Rear Panel Connections

Except for the input signals, listed below, all connections and gating features are identical to that described for the TIME-EXT. (Interval) mode (see Section 3.3.5,D).

3.3.5 (Cont'd)

D. Rear Panel Connections (Cont'd)

A (BNC) - The input signal to be prescaled is applied to this input.

FLOWMETER Connector - Alternately, the flowmeter output may be prescaled thus producing engineering unit totals such as Barrels, Gallons or Pounds.

E. Rear Panel Controls

Identical to Section 3.3.1, E except the EXT. T. B./INT. T. B. Switch has no function in this mode.

3.3.6 REMOTE Programming

Purpose

This allows for remotely selecting the functions which are normally selected by the front panel Function Selector switch, Thumbwheel switches and Multiplier switch. All front panel controls remain as described herein, and a position is provided (REMOTE) on the Function Selector Switch which transfers the instrument from front panel control to remote control. A multiple pin connector is mounted on the rear of the instrument and all connections described below are made through this single connector. Note, that all other control functions, accessible via the Control connector, J5, remain active.

A. Modes

The front panel Function switch must be placed in the REMOTE position. Five pins in the rear mounted connector are used to select any one of the front panel functions. A function is selected by a solid state or contact closure between any one line and circuit Common.

B. Time Base Thumbswitches

Twenty-four pins in the rear mounted connector are used to program the functions normally selected by the front panel thumbswitches; i.e., four lines for each thumbswitch. Control is in the 1,2,4,8 BCD format and Logic "1" control bits are applied in the form of solid state switch or contact closures to the thumbswitch return line (pin 42).

3.3.6 (Cont'd)

C. Multiplier Toggle Switch

Three pins in the rear mounted connector are reserved for the selection of the X1, X10, X100 or X1000 multiplier. Selection is by means of a solid state or contact closure between any one of the three pins and circuit COMMON. Selection of none of these pins automatically selects the Multiplier.

D. Logic Levels

All of the above described control functions are Integrated Circuit DTL and TTL compatible. However, the "zero" volt current sinking capability of the IC is used to select the functions and is designated a Logic "1" in the above description.

Logic "1" = +0.4 V max. with sink current (from 1.6 MA to 8 MA max.).

Logic "0" = +5. 0 V max. or open circuit.

E. Other Front Panel Controls

See Section 3.3 under the appropriate mode callout.

F. Rear Panel Connections

Pin Connections, J102, REMOTE PROGRAMMING

1 - 1 2 - 2	10^0	Remote Time Base Thumbswitches
4 - 1 4 - 2	10^{-1}	
5 - 1 6 - 2	10^{-2}	
7 - 1 8 - 2	10^{-3}	
9 - 1 10 - 2	10^{-4}	

11 -
12 -
13 -
14 -
15 - RATE
16 - TIME (A)

F. Rear Panel Connections (Cont'd)

Pin Connections, J102, REMOTE PROGRAMMING (Cont'd)

17 - TIME (EXT)
18 -
19 -
20 - PRESET COUNT
21 - X1000 MULTIPLIER*
22 - TEST
23 -
24 -
25 -
26 - 4 } 10^0
27 - 8 }
28 - 4 } 10^{-1}
29 - 8 }
30 - 4 } 10^{-2}
31 - 8 }
32 - 4 } 10^{-3}
33 - 8 }
34 - 4 } 10^{-4}
35 - 8 }
36 - } Remote Time Base Thumbswitches
37 -
38 -
39 -
40 - X10 MULTIPLIER*
41 - X100 MULTIPLIER*
42 - REMOTE THUMBSWITCH COMMON
43 -
44 -
45 - 8 }
46 - 4 } 10^1 ——— Remote Time Base Thumbswitches
47 - 2 }
48 - 1 }
49 -
50 - COMMON

*If none of these pins is selected, the X1 Multiplier is automatically selected.

The Mating Connector for J102 is Amphenol 57-30500.

3.4 BCD Printer Output

A parallel BCD output taken from the 1, 2,4 & 8 lines within the Totalizer unit is provided. Four lines for each decade are connected to the external connector J101A located on the rear panel.

Schematic #0104-5033-99, located in Section 4.4, shows the 1, 2, 4 & 8 outputs as they are connected to the Totalizer unit.

"0" state +0.4 VDC maximum, 6 MA maximum sink current.
"1" state +4.7 VDC nominal unloaded with source resistance of 1.8K.

The following chart shows the output connections as contained in the rear panel connector J101.

J101A Terminal Connections

Decade		1	2	3	4	5	6
BCD	1	1	3	5	7	9	11
	2	2	4	6	8	10	12
	4	26	28	30	32	34	36
	8	27	29	31	33	35	37

COMMON - 50, 14, 38, 39 **INHIBIT INPUT- 45

*PRINT COMMAND - 21, 48

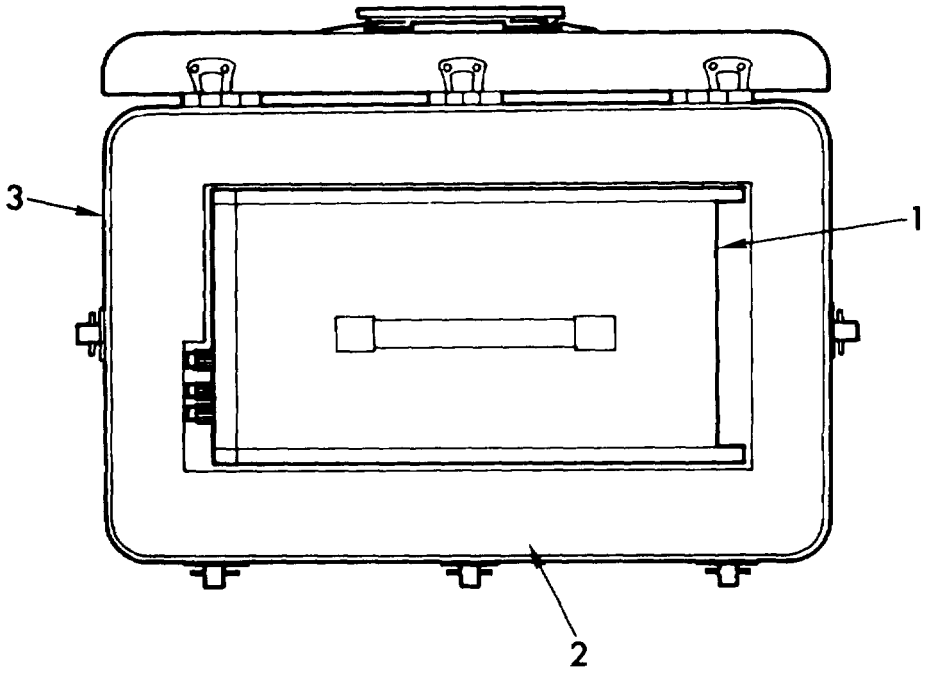
OVERFLOW (O/F) Bit - 13

*This signal is a "1" until the GATE opens and then goes to Logic "0". It returns to Logic "1" at the end of the GATE time.

**When this input is a "0", it inhibits the Display Time cycle from occurring.

3.5 FLOW INDICATOR KIT DESCRIPTION

The Flow Indicator Kit contains Model CF-604-6-8175Q unit which is fully described in its instruction manual (Reference A).



ITEM	NAME	P/N	FED. MFR. SUP. CODE
1	INDICATOR	C50652	14010
2	PACKING	1400-5187-00	14010
3	CASE		

FIGURE 7. FLOW INDICATOR PARTS LAYOUT.

Section IV

MAINTENANCE AND OPERATIION

4.0 INSTALLATION INSTRUCTIONS

Depending upon flow range to be tested, install appropriate sized flowmeter and flow straighteners into test set-up per Figure 8. Although the transducer may be mounted at any attitude, the recommended installation is horizontal, with the pick-off coil up, because this is the usual calibration position.

Twelve to fifteen pipe diameters of straight pipe run, upstream of the transducer, is recommended for maximum accuracy. Five pipe diameters should be provided downstream. Additional straightening vane units may be used where the straight run upstream must be reduced. Straighteners are provided with the Transfer Kit to, eliminate any swirl caused by valving or piping configuration. Refer to Section 2.9 for recommended torque values for installing kit units.

The transducer should be inspected to be certain it is clean, and to see that the rotor rotates freely and easily. Install the meter in the direction of the flow as indicated on the housing. Over-speeding should be avoided and prior to start up, check the meter flow rate shown on the data sheet against system flow rate or pump capacity.

Where particles may be present in the fluid, a filter should be installed ahead of the meter. For 1/2" meters, 170 mesh size is recommended, for 3/4" and 1", 45 mesh, and for 1 1/2" and larger, 18 mesh.

To protect the meter's internal parts against damage from foreign materials in the pipe line, it is advised that a perforated metal screen strainer be installed.

Depending upon distance readout is to be made from test set-up, use 50' or 1 50' cable and mate the flowmeter to the flow indicator per Figure 9. Test unit is now ready for set-up.

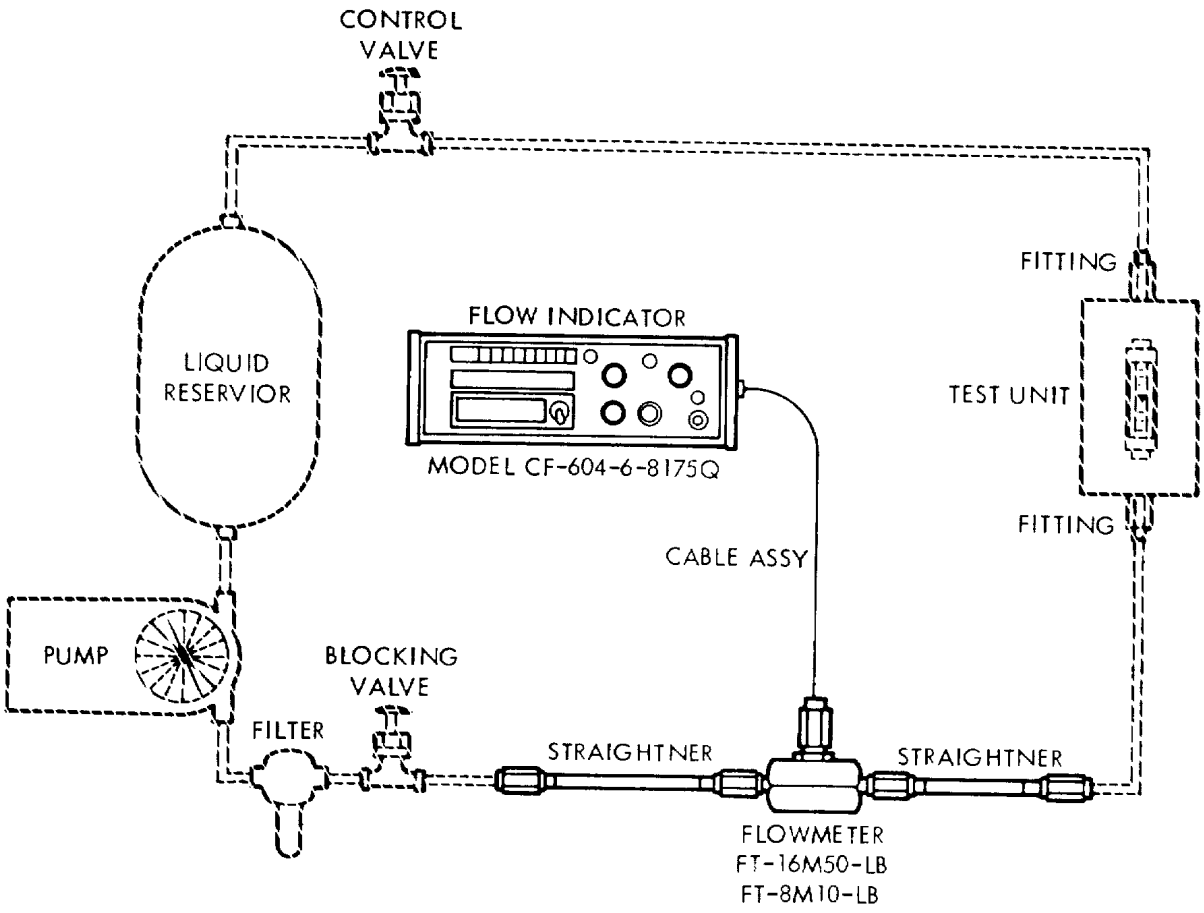


FIGURE 8. TEST SET UP.

4.1A SET UP OF FLOW INDICATOR

Step 1 Use flow range determined in 4.1.

Step 2 Determine the kinematic viscosity (V) of the calibration fluid.

Step 3 Using flow range from Step 1 and the kinematic viscosity from Step 2, refer to the C-factor vs Hz/curve provided in the kit for the flowmeter to be used and determine which portion of the curve is covered by the test unit.

Step 4 a) If the flow range falls within the flat part of the curve (±0.5% of C-factor) set the indicator to read rate as discussed in Section 1.2 of Reference A. This will allow direct reading flow rate in gallons per minute.

b) If the flow range falls outside the flat portion of the curve, set the indicator to read frequency (Hz) as discussed in Section 3.3.1 of Reference A and use the C-factor versus Hz/V curve (Figure 15) to determine the flow rate in gallons per minute.

-NOTE-

GPM = C x Hz where
Hz = Flowmeter Frequency
C = Flowmeter Calibration Constant
IF MASS FLOW RATES ARE DESIRED, CONVERT FROM VOLUMETRIC RATES AS FOLLOWS:
PPH = GPM x 500 x SPECIFIC GRAVITY

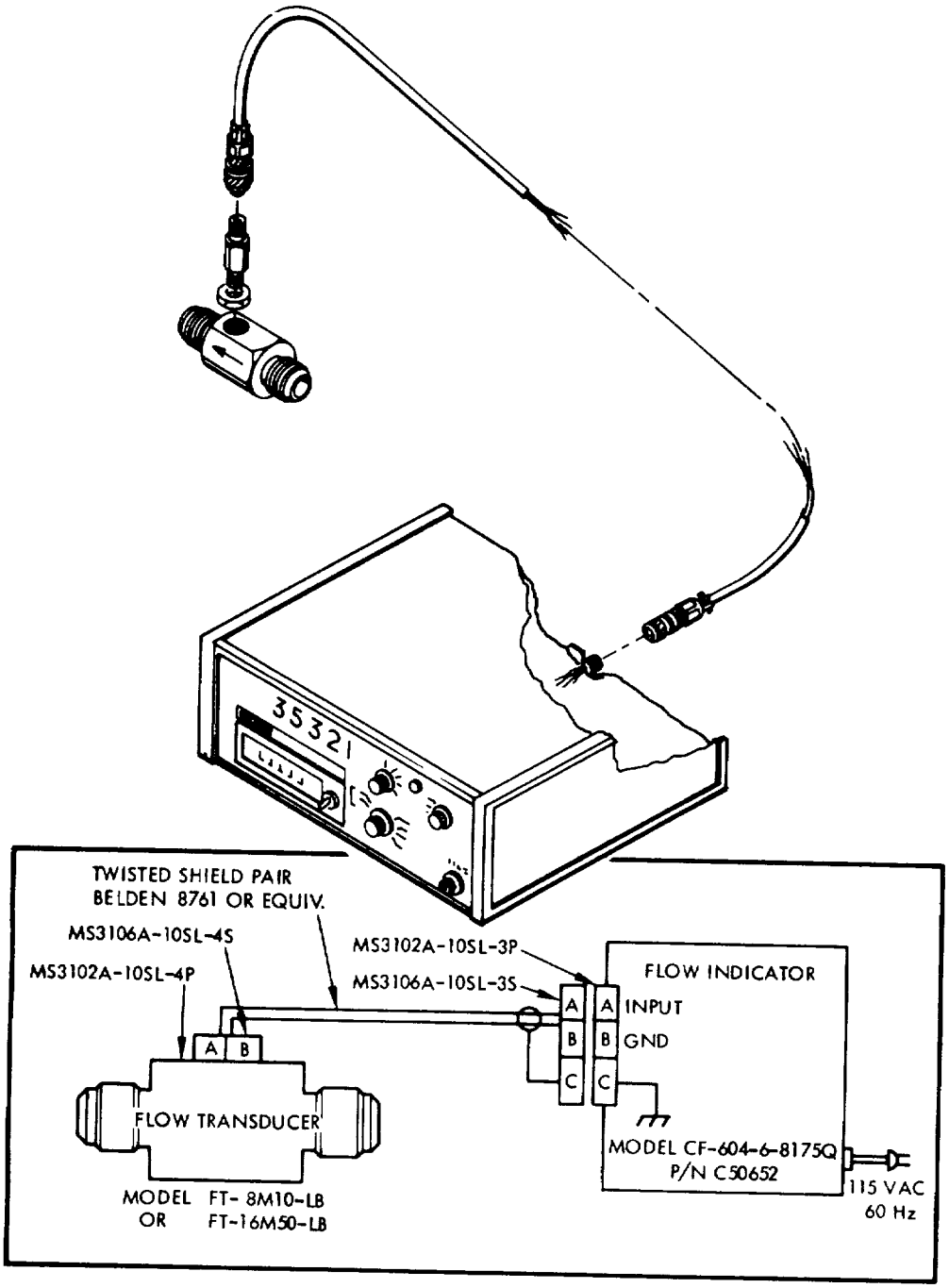


FIGURE 9. WIRING DIAGRAM.

4.1B OPERATION

Once flow indicator is set up, initiate test system observing those procedures necessary to protect the test equipment.

The number of readings taken, or the total number of check points used, is a matter of the tester's preference or need.

Upon completion of testing, observe normal maintenance procedures or, in the case of extended periods of time, storage precautions noted in paragraph 4.1C.

4.1C INSPECTION AND MAINTENANCE

Maintenance of the transducer consists of periodic inspection to determine that the internal parts have not been subjected to fouling or corrosion.

For close examination of internal parts, the support assembly may be withdrawn from the housing through either end of the transducer, after first removing the retainer ring. The meter calibration will not be affected by removing and re-installing the original support assembly.

Should the assembly be damaged in any fashion, it should be returned to the USAMCC for disposition. The support assembly or meter itself may be cleaned with cleaning solvent or alcohol. If the transducer is to be stored or out of service for a considerable length of time, it may first be dipped in light rust preservation or maching oil (caution should be observed if the transducer is later intended for special service such as LOX). The transducer should be located upstream of all final control elements. The transducer should never be installed in such a fashion that when flow ceases the transducer completely drains. Serious damage can be caused by striking a dry transducer with a high velocity fluid stream. The transducer is literally insensitive to damage caused by fluid velocity or hydraulic shock, if it is kept full of fluid at all times. For this reason, all by-pass, throttling, or on/off valves must be located downstream from the transducer.

Care should be taken not to locate the transducer or connector cable in close proximity to strong electro-magnetic fields such as electric motors, transformers, sparking devices or high voltage lines, as these may induce noise voltages in the flowmeter coil.

4.1D BALL BEARING REPLACEMENT

This section is presented as a guide to facilitate in-field replacement of the ball bearings in FT-8M turbine flow transducers. The replacement kit includes the following parts: two (2) ball bearings and two (2) retaining rings. For part numbers refer to page 6-2.

1. Remove retainer ring (4) from either end of transducer housing.

2. Gently slide transducer from the housing being careful not to drop cones or rotor.

3. Remove downstream support (6) and cone (7) from shaft. Rotors are marked on the downstream hub with 2 lines (See Figure 10).

4. Gently slide rotor (10) from shaft.

5. Remove retainer ring (8) from marked side of rotor and slide both bearings (9) from rotor.

6. Install two new bearings into rotor being careful to face both bearings out.

7. Install new retainer ring.

8. Reverse Steps 1 thru 4 for reassembly.

-NOTE-

On FT-16M units, spacer (13) is removed in Step 3 and Step 6. Be sure to re-install spacer between new bearings in Step 6.

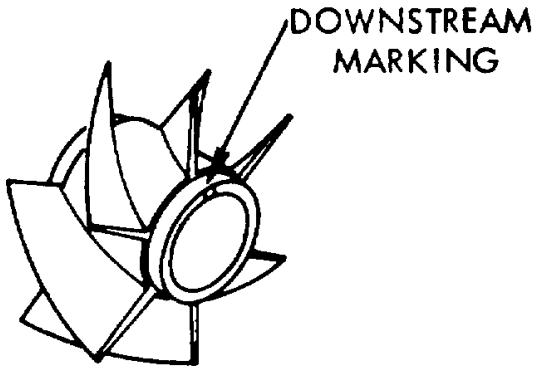


FIGURE 10. ROTOR MARKING.

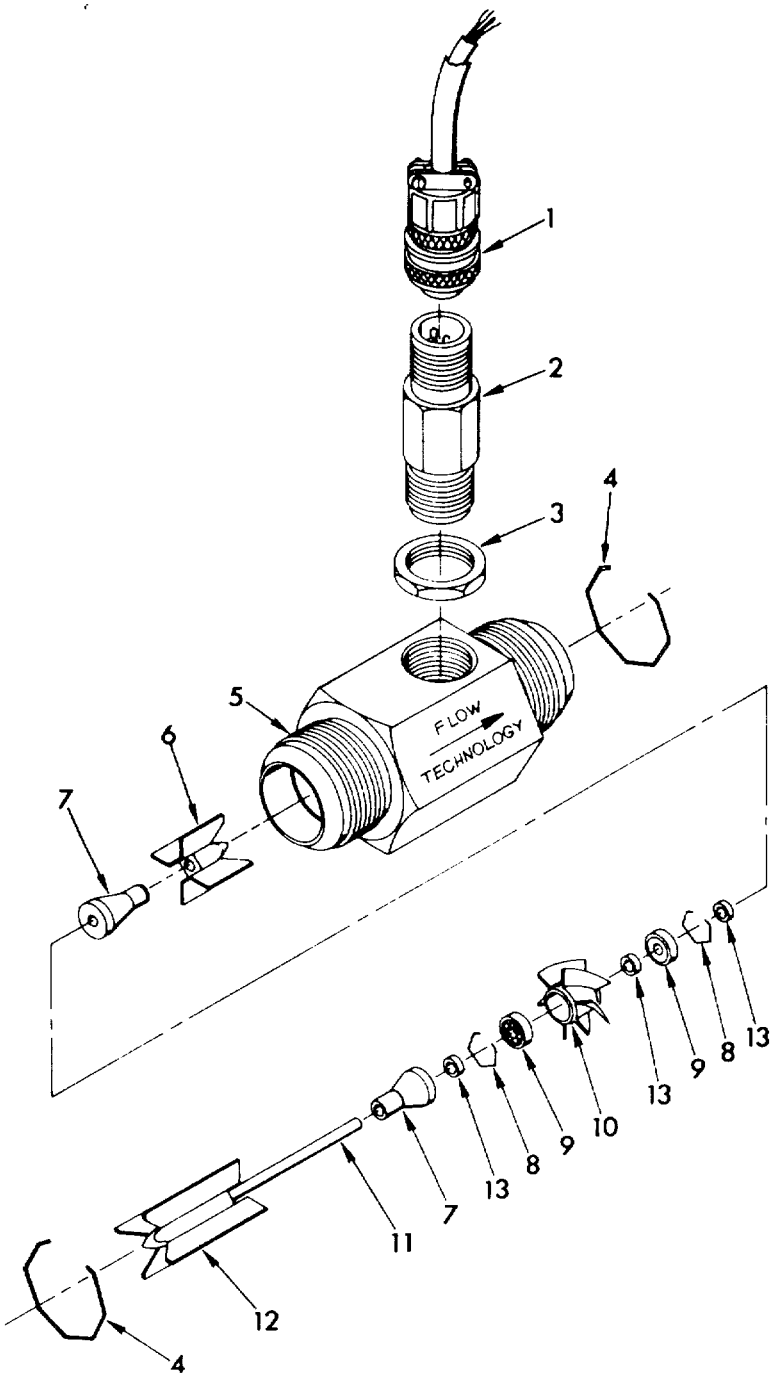


FIGURE 11. COMPLETE DISASSEMBLY 1" FLOW TRANSDUCER.

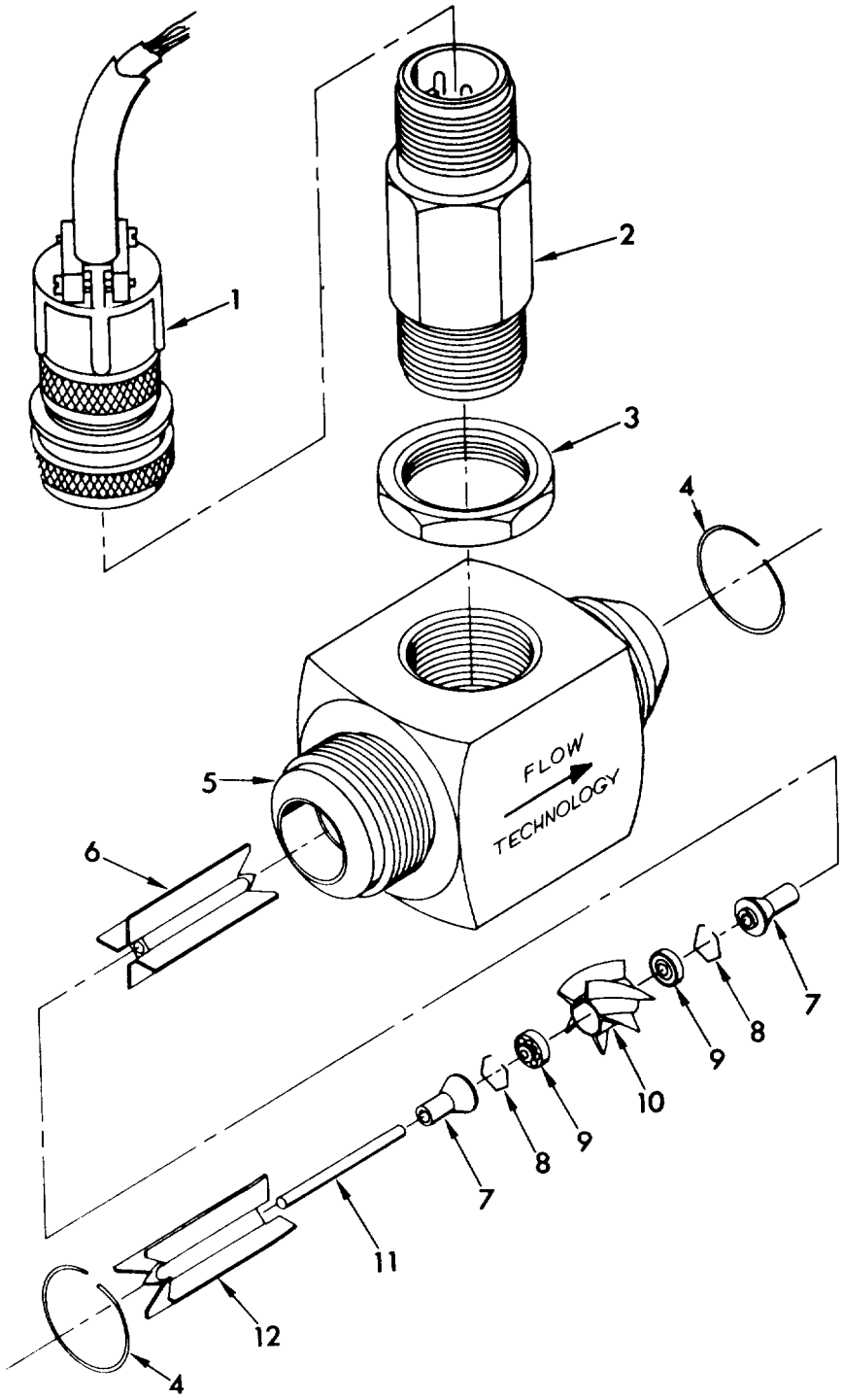


FIGURE 12. COMPLETE DISASSEMBLY 1/2" FLOW TRANSDUCER.

The "600" series Counters have been designed utilizing modular printed circuit boards and plug-in integrated circuits. These design approaches, therefore, minimize maintenance and greatly facilitate troubleshooting. It will be noted in the following sections that once critical check points have been located, the majority of the maintenance problems can be solved merely by replacing defective components. It is anticipated, however, that maintenance will be required much less frequently than ever before on this class of equipment.

Preventive maintenance is not required on a formal basis as occasional operating checks will determine if any circuitry is functioning improperly.

4.1 Calibration

The only calibration required on this instrument is the occasional monitoring of the internal crystal frequency. A terminal on the rear panel is available for monitoring the 1 MHz crystal oscillator. This signal should be compared with a suitable reference calibrated to WWV to insure the absolute accuracies within the capabilities of this instrument.

4.2 Theory of Operation

The following paragraphs describe briefly the basic signal flow paths and the general operational characteristics of the unit. Detailed circuit analysis is not undertaken since with the "600" series counter line the use of integrated circuits obviates the necessity for such detail.

4.2.1 Integrated Circuits

Standardization of the circuitry used has made possible the minimization of IC types employed. The basic IC circuits consist of NAND gates, NOR gates, Flip Flops and Decade Counters. Most IC's contain multiple circuits and care must be exercised in troubleshooting to locate the proper pins on each IC. The enclosed schematics and parts list show IC types and pin numbers to assist in circuit tracing. More detail on the basic circuits within the IC's may be obtained from the IC manufacturer by requesting appropriate data sheets if desired.

4.2.1 (Cont'd)

The IC's chosen for use in the Counters are the TTL family. These units provide fast response with high immunity to noise. All IC's are mounted in the dual-in-line package for insertion in plug-in sockets. The TTL logic levels for all IC's except the readout tube drivers is "O" equals +0.4 V maximum and "1" equals +2.4 V minimum. The drawings contained in this section utilize standard nomenclature which is explained below. All symbols are conventional with those contained in typical IC literature.

o - A circle on any lead leaving or entering an IC indicates that this point is low ("0") when the unit is operational. That is, for a NAND gate, the output is low ("0") when all inputs are high (+, "1").

R - Reset input.

oC - Clock input. The outputs of Flip-Flops and Decade Counter elements change when a negative-going excursion occurs at clock terminals so designated.

J - When enabled, the next clock pulse will set the flip-flop.

K - When enabled, the next clock pulse will reset the flip-flop.

JK - When both J and K are enabled, then the flip-flop operates as a binary from the clock pulses.

Q - Output with “0” (low) when reset.

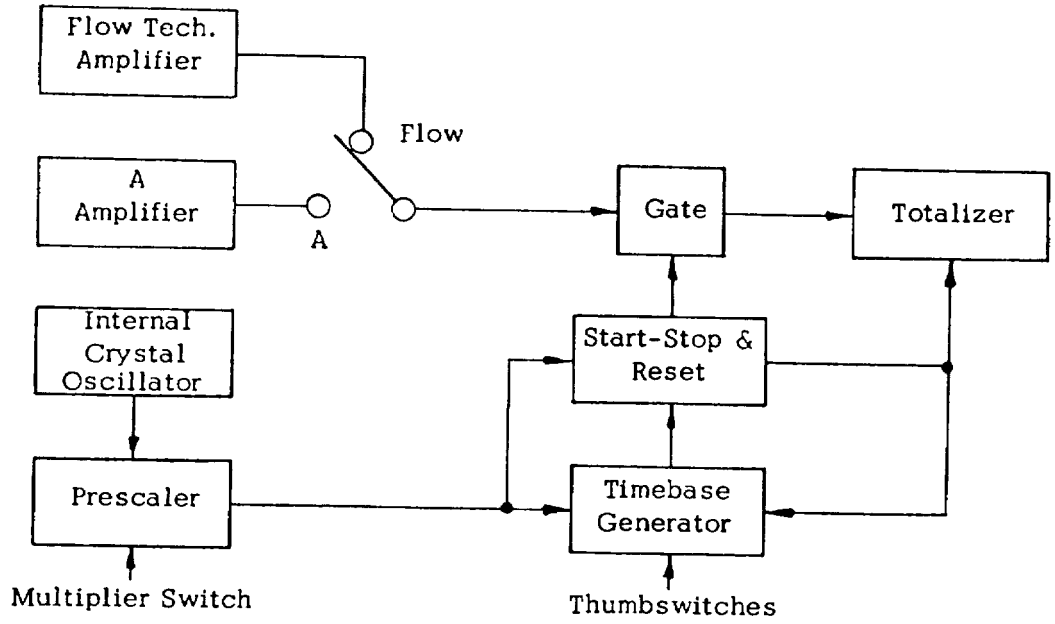
$\overline{Q}$ - Complementary output or "1" (high, +) when reset.

4.2.2 Functional Block Diagrams

The many modes possible with the CF-604-6-8175SQ all use the same basic modules discussed in later paragraphs. In order to facilitate understanding what part each of the modules play during a particular mode of operation, the following simplified block diagrams trace the signal flow for each of the modes selectable by the Mode Selector Switch.

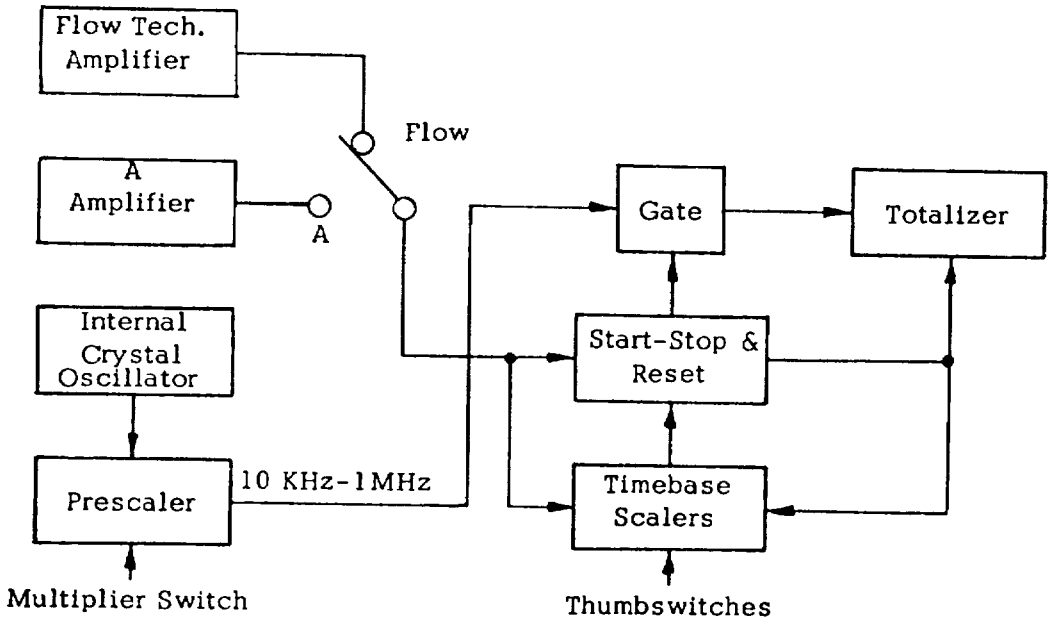
4.2.2 Functional Block Diagrams (Cont'd)

A. RATE



The RATE mode displays the Input signal for the gate time determined by the selection of the Thumbswitches and Multiplier Switch. The first pulse after reset from the internal oscillator starts the automatic timing sequence.

B. TIME-A



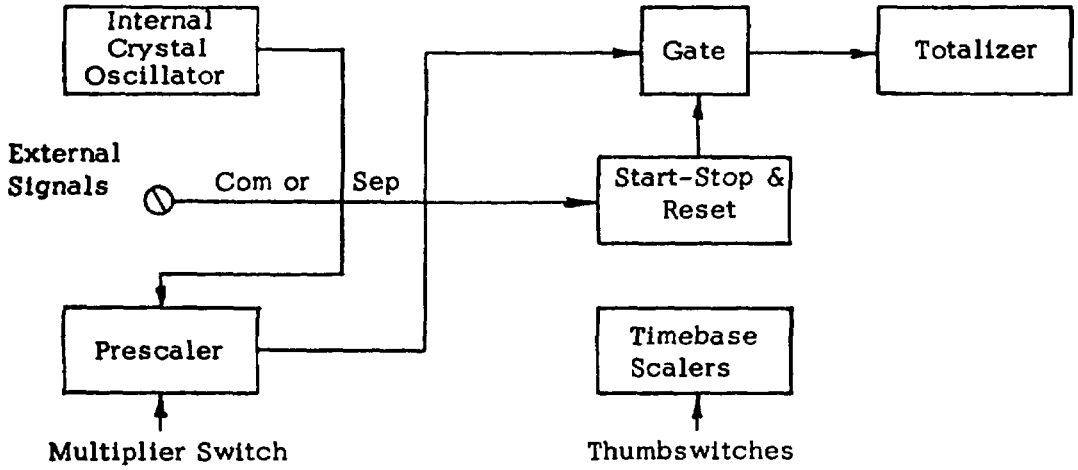
The TIME-A mode displays the internal crystal oscillator frequency as selected by the Multiplier Switch for the duration of the gate time determined by the repetitive occurrences of the Input signal. The Thumbswitches determine the number of repetitive occurrences that are counted. The Input signal also

4.2.2 (Cont'd)

B. TIME-A (Cont'd)

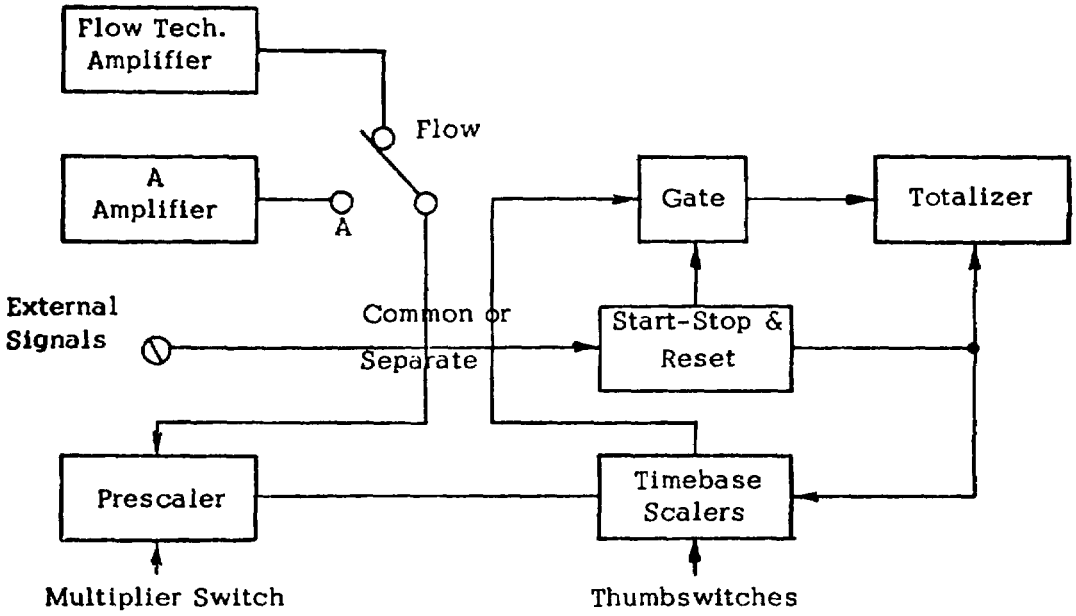
starts the internal timing sequence with the first pulse after reset.

C. TIME-EXT.



The TIME-EXT. mode displays the internal crystal oscillator frequency as selected by the Multiplier Switch for the duration of the gate time as determined by external start and stop signals.

D. PRESET COUNT



4.2.2 (Cont'd)

The PRESET COUNT mode of operation is identical to totalizing except that the addition of the Thumbswitch scalers extends the scaling range and versatility.

4.2.3 Chassis Interconnection Diagram (Dwg. #0100-5097-03)

The Chassis Interconnection Diagram #0100-5097-03 shows the basic subassembly modules of the counter, the associated controls and most of the interconnecting wiring that can be conveniently shown. This diagram is most helpful in locating major functions and for general maintenance troubleshooting. The numbers shown within the major sub-assemblies refer to schematics which are located in Section 4.4 of the manual.

The Input A signal enters the counter at J1 where it passes through the X1, X10 .and X100 attenuator prior to reaching the Input Amplifier. For the FLOW input, this attenuator is bypassed via switch, S3. Concentric to the Input Multiplier (attenuator) control is the vernier gain adjust R106. This control effects the signal degeneration in the first stage of the Input Amplifier. The Input Amplifier conditions the signal to a level suitable for operating the IC circuitry of the logic unit. The signal leaves the Input Amplifier at Pin E of J11 and enters the logic board at Pin F of J12.

The Logic unit consists of numerous control gates. These various gates select the proper signal for feeding to the Totalizer and the decade scalers and these gates are the Totalizer Count Gate, Time Base Count Gate and Signal Gates. The duration of the Totalizer and Time Base Count Gates is determined by the settings of the Thumbswitches S11 and the Multiplier Switch S9. Also within the Logic unit is found all control circuitry required to generate display time, reset, start-stop logic and Thumbswitch coincidence detection. This unit is the most complex portion of the Counter and a more detailed discussion is contained in paragraph 4.2.4. The Chassis Interconnection Diagram shows the associated controls that function with the Logic unit to determine the proper operating conditions. Critical signal flow lines are also shown on this diagram and it will be noted that the gated input signal leaves the Logic unit on Pin 5 of J12 and enters the totalizer on Pin 4 of J10. The reset command generated by the Logic unit enters the totalizer on Pin E of J10. All signals contained in the CONTROL connector J5 at the rear of the unit are indicated on the Chassis Interconnection Diagram and their appropriate connections to the Logic unit are shown.

4.2.3 (Cont'd)

The Totalizer unit is a multistage decade counter with display. The proper signal, after having been processed by the Logic unit, is counted in the Totalizer. The Totalizer merely accepts the pulses from the Logic unit, converts them to decimal format where they are displayed in the glow discharge readout tubes and presented to external printers, etc. in proper format.

Other items shown on the Chassis Interconnection Diagram are the Power Supply, Transformer and external connection points. The Power Supply provides the regulated +5 V necessary for all IC and transistor circuitry used throughout the counter.

Also supplied is +180 V peak that is used by the glow discharge display tubes. Each of these supply potentials may be easily monitored throughout the system as shown on the diagram. A separate drawing of the transformer #0103-5005-04 is located in Section 4.4 and shows terminal connections for 115 V operation or 230 V operation. Conversion from one voltage source to another is accomplished merely by setting S17 to the proper position and reducing the fuse by one-half.

4.2.4 Input Amplifier (Dwg. #0102-5000-03)

The Input Amplifier consists of a field effect transistor input stage Q1 coupled to the linear amplifier stage. The amplifier includes a low pass filter between these stages to eliminate high frequency noise. This unit has been designed to begin its 12 db per octave roll-off characteristic at approximately 5 KHz. This is followed by a linear gain stage Q2 driving a DC coupled saturating switch. The switching stages Q3 and Q4 are set for a high threshold, thereby greatly reducing sensitivity to noise. In the quiescent state, Q4 is conducting and Q3 is off. The final stage Q5 is used to provide an inverted output where required.

The Input Amplifier features high sensitivity with limited bandwidth. It is intended for use with low level output devices such as tachometer, turbine flowmeters and other electromagnetic sensors. The upper frequency limit is deliberately rolled off to minimize noise pickup from unwanted signals. Because input sensitivity above 5 KHz is reduced at a rate of 12 db per octave, the effects of high frequency electrical noise transients generated externally by solenoids and other combinations of inductors and switches are greatly minimized. Check The Specifications, Section 1.1 for maximum amplitude signals allowable with the various settings of the Input Multiplier.

4.2.5 Logic (Sch. #0102-5139-04)

The Logic unit contains all the basic timing and gating circuits necessary to derive the precision time base and to sequence the internal functions. Also, as part of this unit, are the display time generator, reset gate and start-stop gating logic. For convenience of discussion, the logic unit will be considered to consist of three basic sections: a Time Base Generator section, Start-Stop and Count Gate Generator section, and a Display and Reset section. Throughout the text reference to Z numbers indicates the particular IC unit under discussion with the dash number signifying a particular input or output.

A. Time Base Generator

The source of the internal time base generation is a crystal controlled 1 MHz oscillator Y1 and Q2. A trimmer capacitor C11 is used for exact frequency setting. This adjustment is set at the factory and will require only occasional resetting as aging of the components takes place. The output of the oscillator feeds NAND gate IC Z12-12 and 13 where the signal is amplified and squared for submission to the gating and scaler IC's. When using an external signal for the time base generation, the 1 MHz crystal oscillator signal is gated off and is replaced by the signal connected to the EXT. T. B. connector. This is accomplished by activating gate Z37-13 (Internal) or Z13-4 (External). Signal gates determine the proper selection of the signal to be fed to the Time Base Gate Z14-2 as enabled by the setting of the function selector switch. The basic 1 MHz oscillator frequency (and externally applied reference) is initially divided by 10 through Z16. Signal gates enable the proper signal by application of a positive potential (Logic "1") to the NAND gate control input. The desired clock frequency is selected by the setting of the X1, X10, X100, X1000 multiplier switch which enables the proper output from the prescaler decade IC's Z17, Z18 and Z38 by applying a positive signal to the appropriate section of gate Z15 or gate Z37-10.

Time Base gate Z14 will be opened when the count gate signal at pin 1 is high (discussed in Section B following). With Z14-1 enabled, the pulses arriving at pin 2 of Z14 proceed into the decade scaler system (Z19 through Z34). The count will continue to accumulate in the decade scalers until such time as the Count Gate signal changes from high to low (see Timing Chart Fig. 4-1). This level

4.2.5 (Cont'd)

A. Time Base Generator (Cont'd)

change will occur after coincidence is achieved in the Time Base Generator or when reset is initiated.

The thumbswitch coincidence circuit operates in conjunction with the decade scalers Z19 through Z34. NOR gates Z29 through Z35 are used to compare the scaler count to the thumbswitch setting. These NOR gates drive the coincidence summing and inverting NAND gates Z24 through Z36 which are connected in a "wired OR" configuration. The line common to the output of these NAND gates is low (Logic "0") once a number has been set into any of the thumbswitches, and when coincidence is achieved, this level changes to the high level (Logic "1"). For this to occur, the output of each NOR gate Z29 through Z35 must be at, or changed to, the low level.

The NOR gate used in this counter differs from the NAND gate in that its output is low when either or both inputs are high. Note that the thumbswitch input to each NOR gate is connected to +5 volts through a resistor. Therefore, unless a thumbswitch number has been selected, these inputs remain high and essentially lock out that gate from the active coincidence process. When a number is set into the BCD thumbswitches, the appropriate 1, 2, 4, 8 lines are sent low (grounded) and the corresponding NOR input from the scaler then becomes active in the coincidence process.

The Time base counting process always begins from a "cleared" or reset condition. All scalers in the system start from the zero state, i.e., all output lines are low, and consequently, both inputs to the NOR gates selected by the thumbswitches are initially low. The output of these NOR gates will change from high to low only when the input line from the associated scaler changes to the high level by virtue of the count accumulated in the scalers matching the number selected. The coincidence condition, therefore, defined as a level change from low to high on "the common line" or summing junction of all of the coincidence NAND gates (pin 4 of Z7) occurs when all of the conditions cited above are satisfied.

A special condition of the coincidence detector occurs when the thumbswitches are set to .000000 (actual gate time of 10.00000 seconds). When this situation arises, the summing junction appears

4.2.5 (Cont'd)

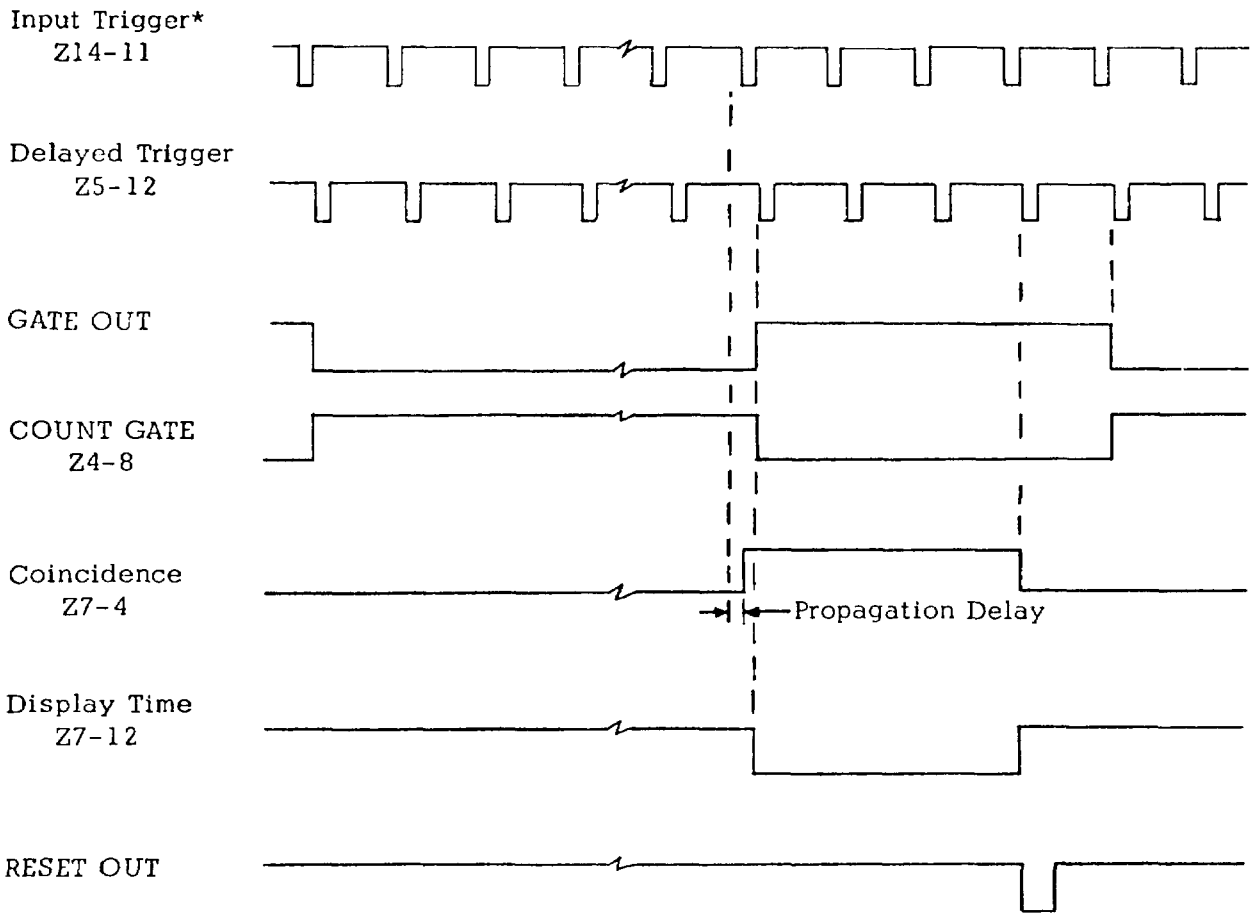
A. Time Base Generator (Cont'd)

as if coincidence had occurred even though no counts have been received within the decade counters. To take care of this special condition, a bistable flip-flop Z9-5 has been included that operates off of the carry signal from the last decade Z34 and the reset command. IC gate Z11-5 detects that the coincidence summing junction is in the high state and, therefore, enables Z11-13. This enables the carry signal from Z34 through inverting gate Zll-9, to set the toggle flip-flop. The delay introduced by the RC network in the gate line from the coincidence summing junction is to assure that the reset pulse has cleared Z9-6 before the necessary clock pulse is present at Z9-5 to set the flip-flop as required to indicate coincidence. In this situation, the output of Z9-8 serves as the coincidence signal to end the count gate.

B. Start-Stop and Count Gate Generator

The first pulse leaving the signal gate Z14-11 and entering the count gate delay generator Z5-1 after completion of reset is the internal start command that will initiate the count gate. NAND gates Z5-3, Z5-6 and the associated components form a mono-stable multivibrator (one-shot) which introduces a delay of approximately 500-750 nanoseconds. This delay balances the circuit delays caused by the propagation time through the time base generator scalers and coincidence detecting system. Depending upon the setting of the function switch, the delayed pulse train will pass through gates Z5-12, & Z6-13 to set flip-flop Z8-12. The flip-flops Z8-12 and Z9-1 are essentially a two-stage counter that work to control the count gate and display logic. The truth table and description shown in the accompanying table (Fig.4-2) will help to illustrate the functions of this two-stage counter. Once the first stage Z8-12 has been set, then the Count Gate Z4-8 enables the Time Base Gate Z14-1 and Totalizer Gate Z2-5. This condition will exist until coincidence has occurred or the counter is reset by external methods. Once Z8-12 has been set by the initial delayed trigger pulse, further pulses from the delay generator Z5-6 are prevented from triggering Z8 by the low output of Z5-8. However, once coincidence has occurred, the NAND gate Z7 is enabled by the presence of the coincidence signal at pin 4. This then allows the next delayed pulse to trigger Z8. Since Z7-6 through Z5-8 has enabled

TIMING DIAGRAM



*100 Hz to 100 KHz internal clock or 1 MHz max. external

Fig. 4-1.

Z8 & Z9 TRUTH TABLE

Q Output Z8-8	Z9-12	
0	0	Reset condition awaiting delayed trigger pulses
1	0	Count gate open, Totalizer and Time Base gates enabled by Z4-9
0	1	Count gate closed, display timer started
1	1	Initiates system reset by enabling Z10-2

Fig. 4-2.

4.2.5 (Cont'd)

B. Start-Stop and Count Gate Generator (Cont'd)

the K input to pin 9, this triggering action then sets Z9 and turns off the count gate. Z9 having been set enables the operation of the display time circuit and automatic reset.

C. DISPLAY and RESET

The display time generator consists of transistors Q4 and Q5. Q5 is a unijunction oscillator which is normally clamped by Q4 preventing oscillations. Once the output of Z9-13 switches low by virtue of the completion of the counting cycle, then Q4 is cut off and Q5 is free to oscillate for one cycle only. The duration of the cycle is determined by the setting of the DISPLAY TIME control. The DISPLAY TIME control determines the rate at which C23 in the oscillator circuit can charge. When Q5 reaches its trigger point, it conducts, and a potential is supplied to Z7-1 which sets Z8 for the second time. As this occurs, NAND gate Z10-2 initiates the generation of the reset process via gate Z7-9. Gates Z7-8 and Z10-11 and their associated RC networks form a one-shot whose pulse duration is approximately 60 microseconds. Several NAND gates (Z10) are used to provide proper polarity reset signals for the various functional units within the counter. The reset signal returns Z8 and Z9 to the initial quiescent state where they remain until another start pulse arrives at the input to Z8-12. A reset signal from Z10-8 also clears the decade scalers, and a signal from Z7-8 clears the Totalizer section.

D. Totalizer Overflow

Also contained on this board is the overflow (O/F) flip-flop, Z37-1 and -4. This flip-flop will set whenever a negative pulse (carry) occurs at J13-Z. It is reset by Z10-6 in the normal reset action. The output of the flip-flop is returned to the totalizer board and applied to a storage latch.

4.2.6 Totalizer (Sch.40104-5033-99)

The Totalizer unit consists of (decade counters, display tube drivers, and memory storage IC's. One of each is used for every decade of the display. Schematic #0104-5033-99 shows the entire Totalizer unit.

4.2.6 (Cont'd)

The functional operation of this unit is basic to the operation of the standard IC logic blocks used throughout. The decade counters are connected with carry and reset lines to perform the standard totalizer function. IC's 1Z1 through 6Z1 form the basic totalizer.

The display tube drivers take the outputs from the memory storage and provide the necessary voltage gain to drive the display tubes. IC's 1Z3 through 6Z3 are the display tube drivers.

The memory storage is provided by a series of IC's that are updated only at the completion of the count gate. The trailing edge of the count gate actually triggers the memory elements. Digits that have had no change during the count gate remain unchanged and only -those that require changing are affected. IC's 1Z2 through 6Z2 are the memory elements.

A seventh storage IC, 7Z2, is used to store the overflow bit. The output of 7Z2 drives a transistor which lights the O/F lamp.

The display tubes are driven directly from the output of the driver IC's 1Z3 through 6Z3. The display tubes VI through V6 are glow-discharge numerical indicators that operate with a driving signal swing (excursion) of approximately 50 V from the IC driver and require an excitation voltage of +180 V peak. The conversion from binary to ten-line output is also supplied by the IC drivers.

Also on this board, as part of the O/F lamp assembly, is the GATE lamp. It is driven from a transistor (Q7) on the logic board.

4.2.7 Power Supply (Sch. #0102-5037-03)

The Power Supply consists of a transformer, 4.5 V rectifier, filter and regulator and the +180 V rectifier and regulator. Each supply is independent except that the +180 V supply uses the output of the +5 V supply as its reference.

The +5 V supply uses a full wave center tapped rectifier, high capacitance filter C102 and a series regulator. CR10 is the Zener reference element for the series regulator. R9 provides a means for adjusting the supply to +5 V ±.05 V. This potentiometer is set at the factory and should not require adjustment except after replacement of critical components within the power supply.

4.2.7 (Cont'd)

The +180 V supply uses a half wave rectifier and series regulator. The regulator uses the +5 V supply as its reference and, therefore, the +5 V source must be properly calibrated prior to adjusting the +180 V source. R2 adjusts the +180 V supply to +180 V ±5 V. The voltage out of the transformer is deliberately greater than 180 V which enables the series regulator to essentially subtract from this potential the necessary amount to deliver the required +180 V between pin 5 of P1 and COMMON.

Both voltage supplies can withstand momentary output shorts due to the inclusion of overload protection transistors Q2 and Q4; however, due to internal heating, excessive damage may be sustained by prolonged shorted output.

The power transformer T1 and filter capacitor C102 are located on the chassis separate from the Power Supply Regulator component board. For details on the transformer connections, see Dwg. #0103-5005-04.

4.3 Troubleshooting

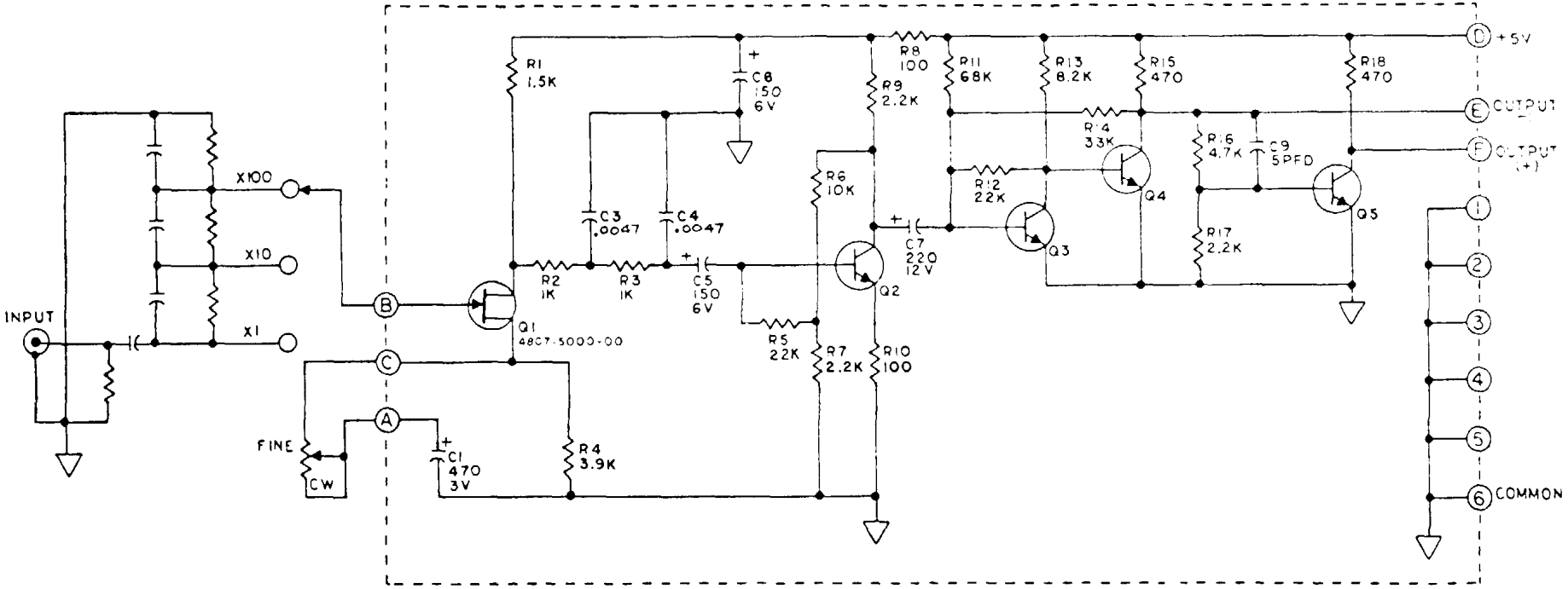
The reliable performance of integrated circuits virtually eliminates the need for maintenance programs, and with the "600" series counters, plug-in integrated circuits make even the occasional maintenance requirement a simple procedure. Section IV of the manual has been constructed to enable the maintenance technician to quickly isolate the trouble and identify the erring component. Because IC testers are expensive and not universally available, it is recommended that a set of replacement units be available where maintenance is to be performed. The standardization of components used throughout the counter greatly reduces the number of components required and spare parts provisioning is thereby simplified.

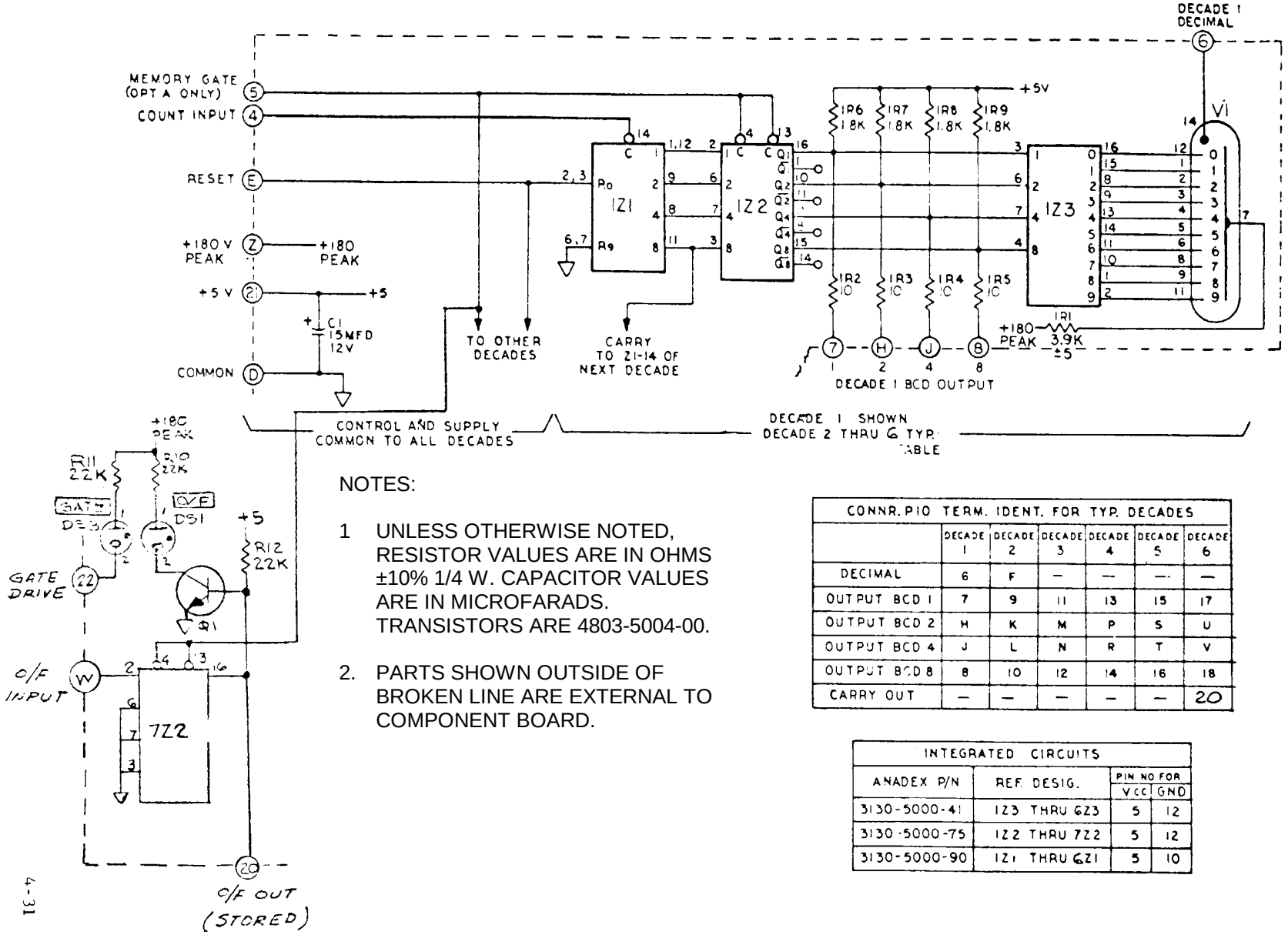
Integrated circuits can be readily interchanged if one is suspected of being faulty. However, care must be taken to assure proper replacement of the item. First, check to make certain that the replacement unit is of the correct type as indicated on the appropriate parts list. Second, check proper orientation of the IC by making certain that the notched end of the IC is inserted at the end of the socket exhibiting a beveled corner. Third, change IC's only with the power OFF.

Many apparent failures in counters can be traced to incorrect signals or improper connections, rather than actual component failure. If the counter fails to operate properly, double check all input signal levels against those specified in the Specification Sheet, Section I, and make certain all controls are set according to the procedures defined in Section III of the manual.

1. UNLESS OTHERWISE NOTED:
   RESISTOR VALUES ARE IN OHMS ±10%, 1/4W
   CAPACITOR VALUES ARE IN MICROFARADS.
   TRANSISTORS ARE 4803-4143-00.

2. PARTS SHOWN OUTSIDE OF BROKEN LINE
   ARE EXTERNAL TO COMPONENT BOARD.





NOTES:

1 UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS ±10% 1/4 W. CAPACITOR VALUES ARE IN MICROFARADS. TRANSISTORS ARE 4803-5004-00.

2. PARTS SHOWN OUTSIDE OF BROKEN LINE ARE EXTERNAL TO COMPONENT BOARD.

CONNR. P10 TERM. IDENT. FOR TYP. DECADES						
	DECADE 1	DECADE 2	DECADE 3	DECADE 4	DECADE 5	DECADE 6
DECIMAL	6	F	—	—	—	—
OUTPUT BCD 1	7	9	11	13	15	17
OUTPUT BCD 2	H	K	M	P	S	U
OUTPUT BCD 4	J	L	N	R	T	V
OUTPUT BCD 8	8	10	12	14	16	18
CARRY OUT	—	—	—	—	—	20

INTEGRATED CIRCUITS			
ANADEX P/N	REF. DESIG.	PIN NO FOR VCC	PIN NO FOR GND
3130-5000-41	1Z3 THRU 6Z3	5	12
3130-5000-75	1Z2 THRU 7Z2	5	12
3130-5000-90	1Z1 THRU 6Z1	5	10

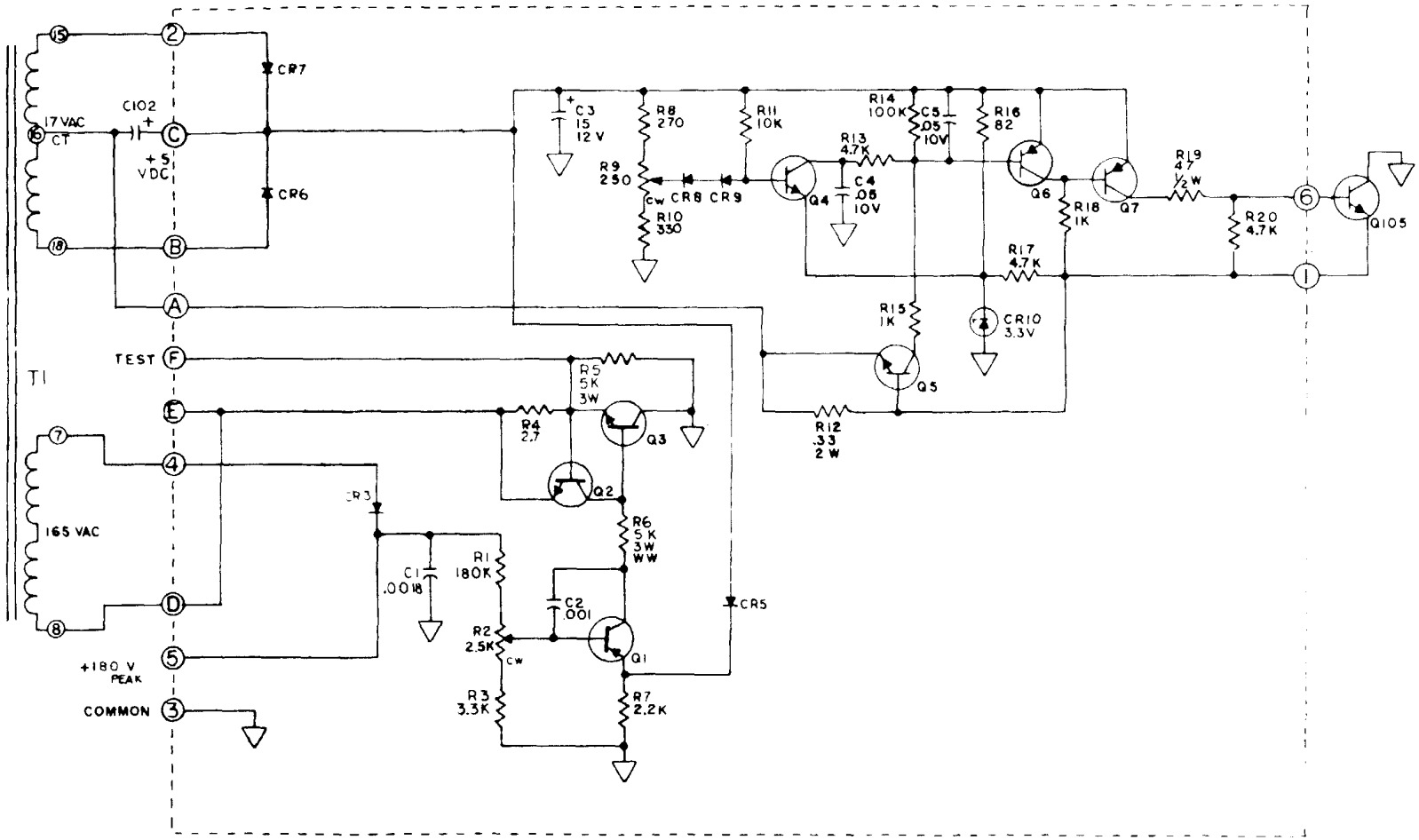
SCHEMATIC, TOTALIZER 0104-5033-99

1. UNLESS OTHERWISE NOTED:
   RESISTOR VALUES ARE IN OHMS ±10%, 1/4W.
   CAPACITOR VALUES ARE IN MICROFARADS.

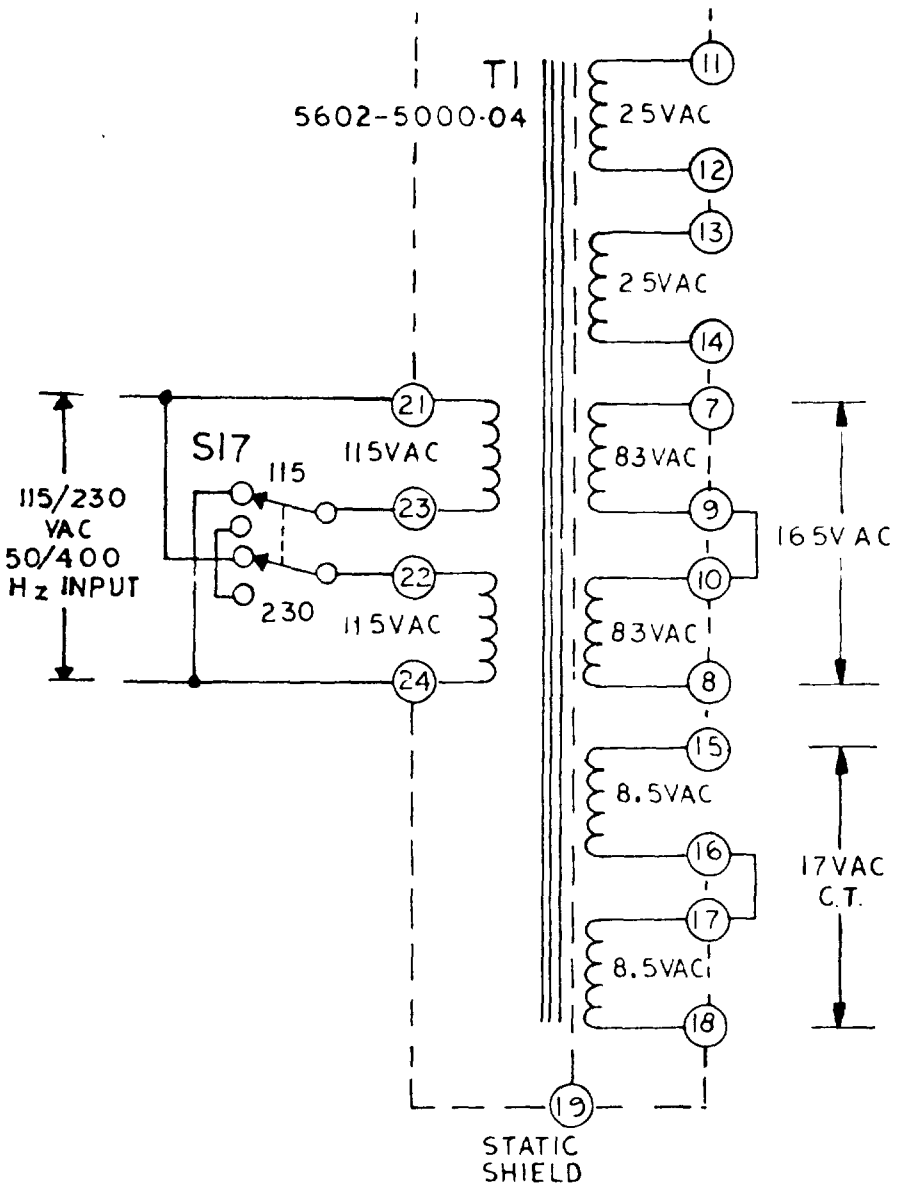
2. PARTS SHOWN OUTSIDE OF BROKEN LINE
   ARE EXTERNAL TO COMPONENT BOARD.

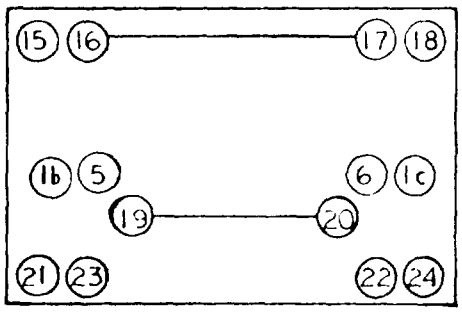
SYMBOL	ANADEX P/N
CR3	4801-5001-00
CR5,8,9	4801-2541-00
CR6,7	4801-5002-00
CR10	4802-5000-00

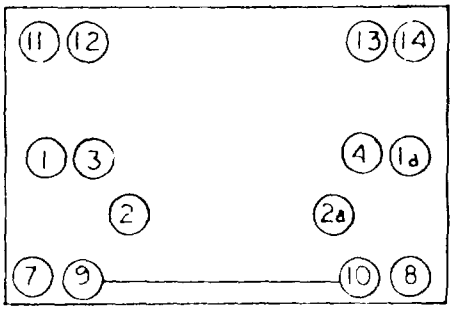
SYMBOL	ANADEX P/N
Q1,6,7	4804-3126-00
Q2,4,5	4803-4169-00
Q3	4803-5002-00



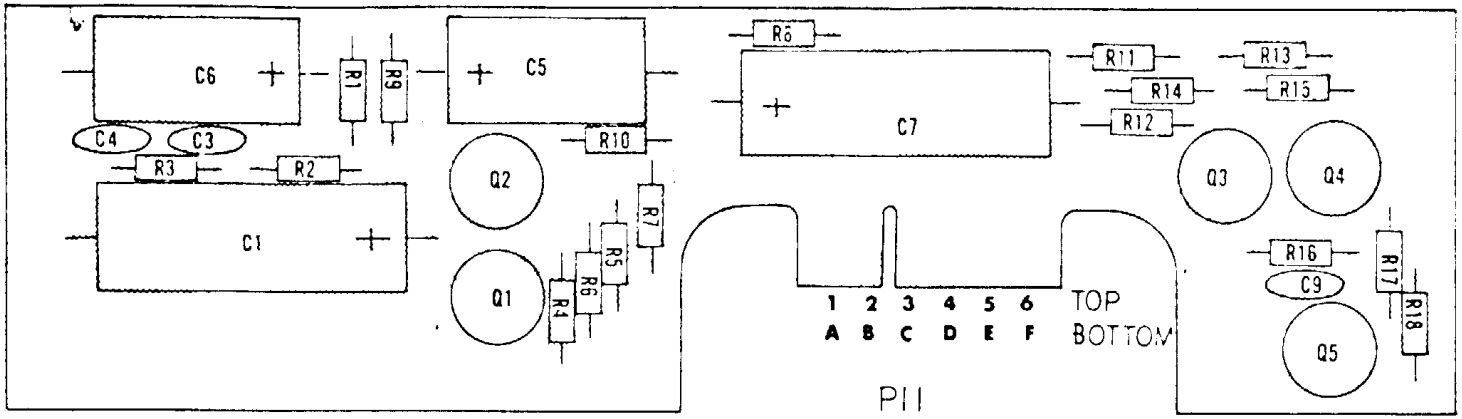
SCHEMATIC, POWER SUPPLY REGULATOR 01102-5037-03


T1
5602-5000-04
25VAC
25VAC
83VAC
83VAC
8.5VAC
8.5VAC
165VAC
17VAC
C.T.
S17
115
230
115VAC
115VAC
115/230
VAC
50/400
Hz INPUT
STATIC
SHIELD


15
16
17
18
1b
5
6
1c
19
20
21
23
22
24


11
12
13
14
1
3
4
1a
2
2a
7
9
10
8

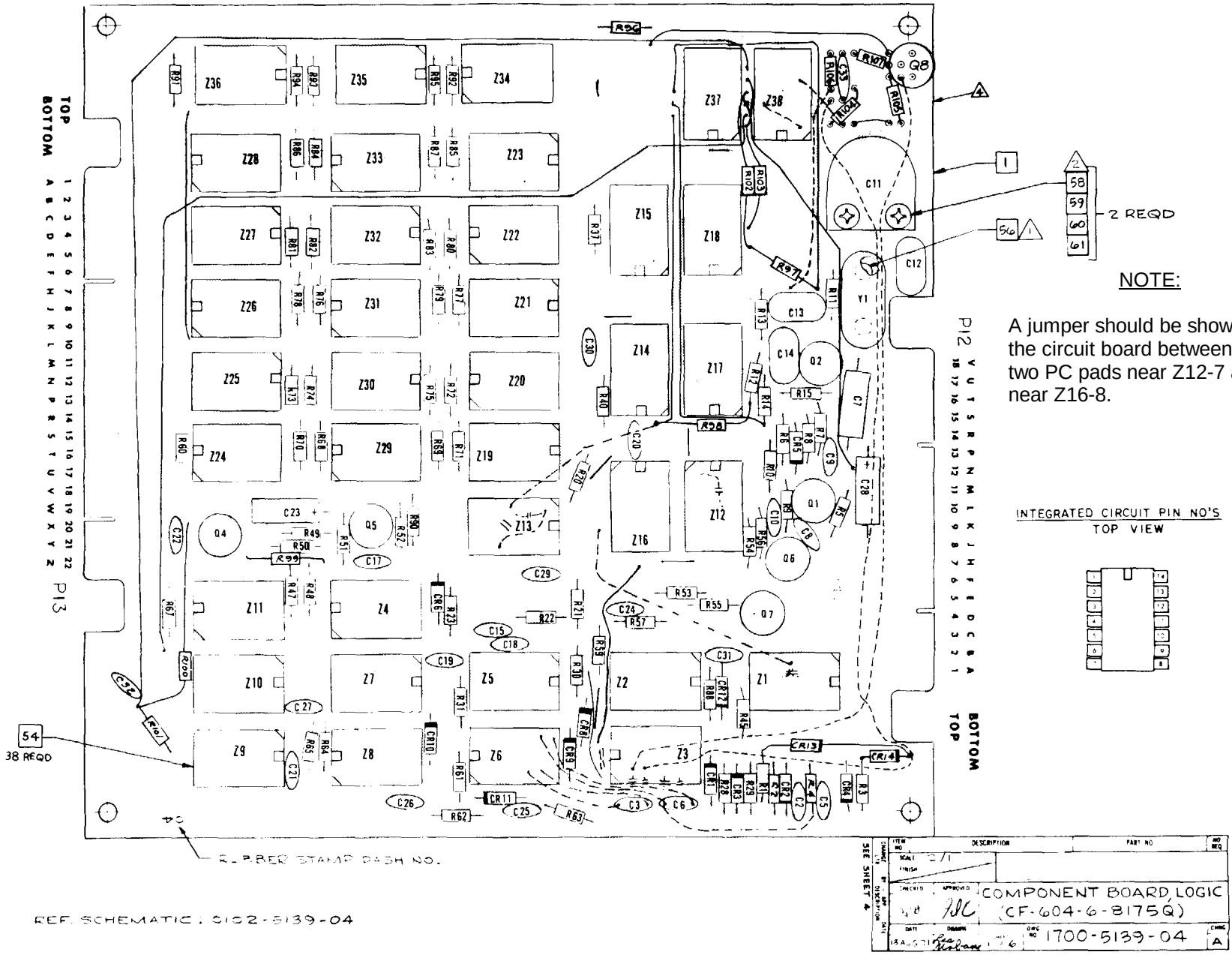
4-33



NOTES
1 REFERENCE SCHEMATIC
0108-5000-03

SEE SHEET 3	CHANGE LTR — BY — APP — DESCRIPTION — DATE	SCALE 2 X FINISH —			
		COMPONENT BOARD, INPUT AMPLIFIER -			
		DATE	DRAWN	CHECKED	APPROVED
		12-23-71	VMS		
		DWG NO 1700-5000-03			CHNG
		SHEET 1 OF 4			

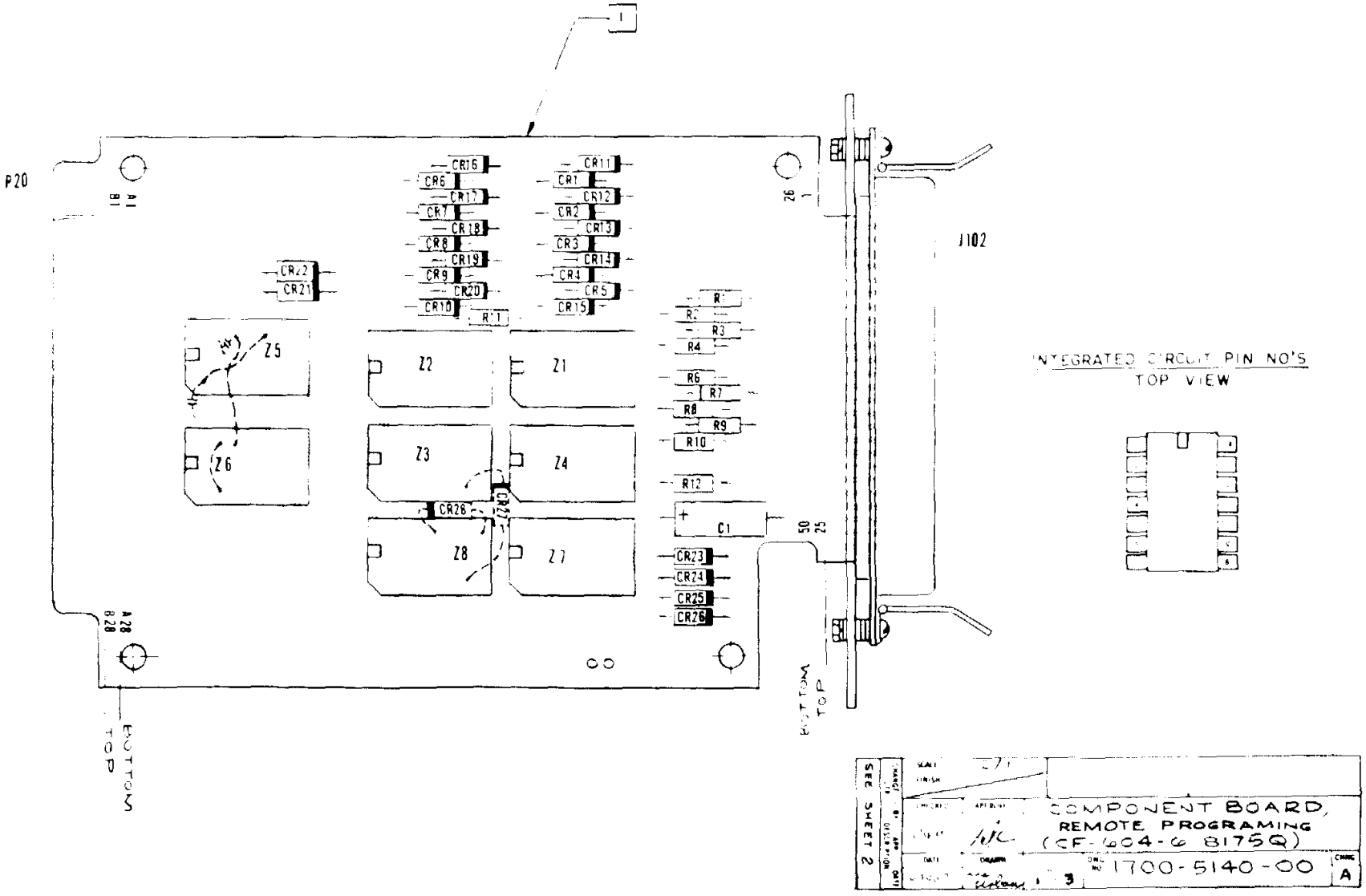
1700-5000-03


TOP
BOTTOM
A B C D E F H J K L M N P R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
P13
P12
18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
V U T S R P N M L K J H F E D C B A
BOTTOM
TOP
54
38 REQD
58
59
2 REQD
NOTE:
A jumper should be shown on the circuit board between the two PC pads near Z12-7 and near Z16-8.
INTEGRATED CIRCUIT PIN NO'S
TOP VIEW
RUBBER STAMP DASH NO.
REF. SCHEMATIC: 5102-5139-04
SEE SHEET 4
DESCRIPTION
PART NO
COMPONENT BOARD, LOGIC
(CF-604-6-8175Q)
1700-5139-04
A

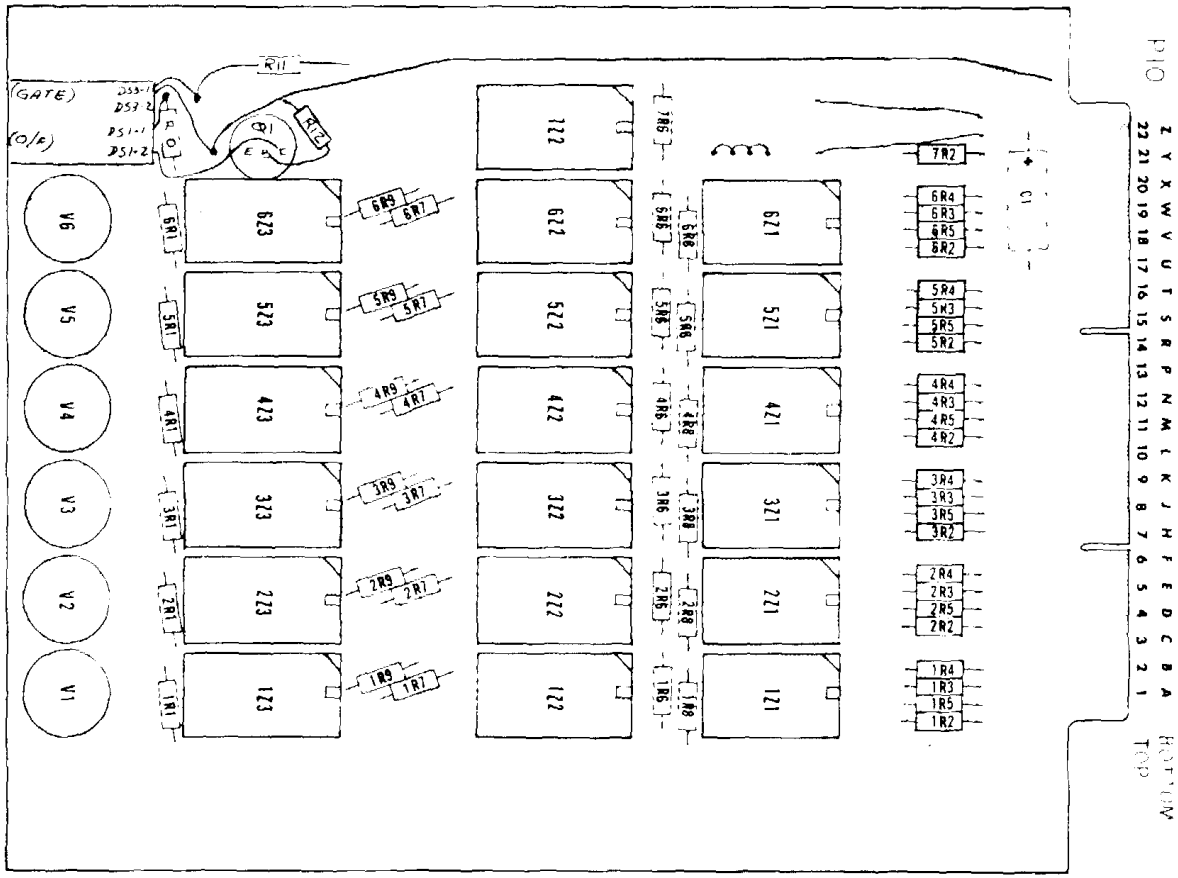
NOTES: 1. REF. SCHEMATIC :0102-5140-00

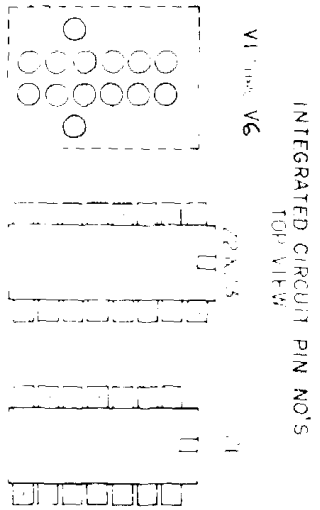
NOTE

The jumper between Z5-1 and Z5-2 is an error and should be removed. A jumper should be shown between Z5-1 and Z5-10.



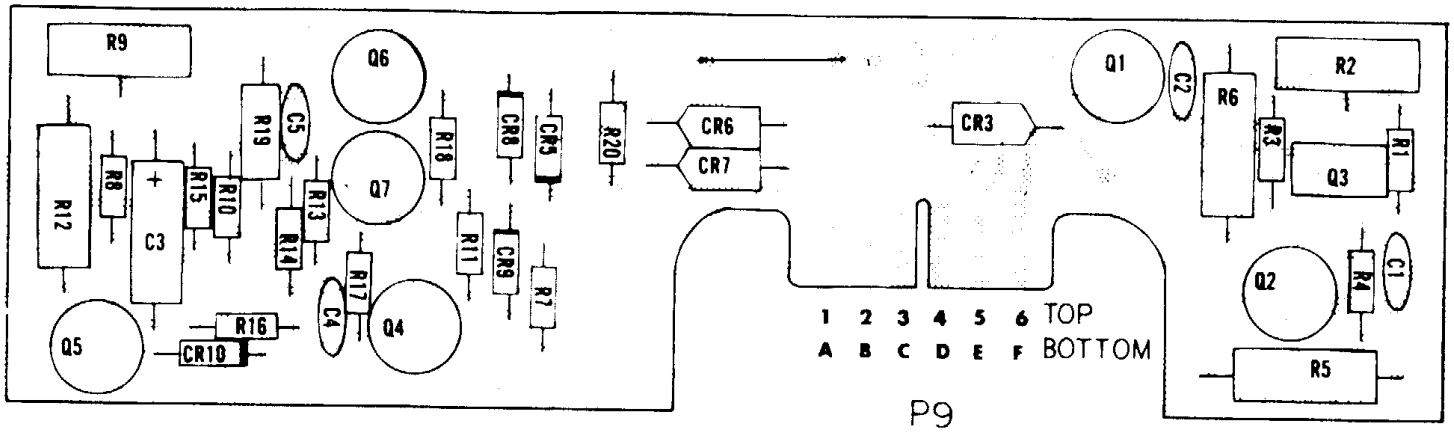
1700-5140-00A





	SCALE					
	FINISH NONE					
COMPONENT BOARD. TOTALIZER - CF-604-6-8175Q						
	DATE	DRAWN	CHECKED	APPROVED	DWG NO 1704-5033-99	CHANGE

1704 5033 99



NOTES;
1. REF SCH: 0102-5037-03

SEE SHEET 3

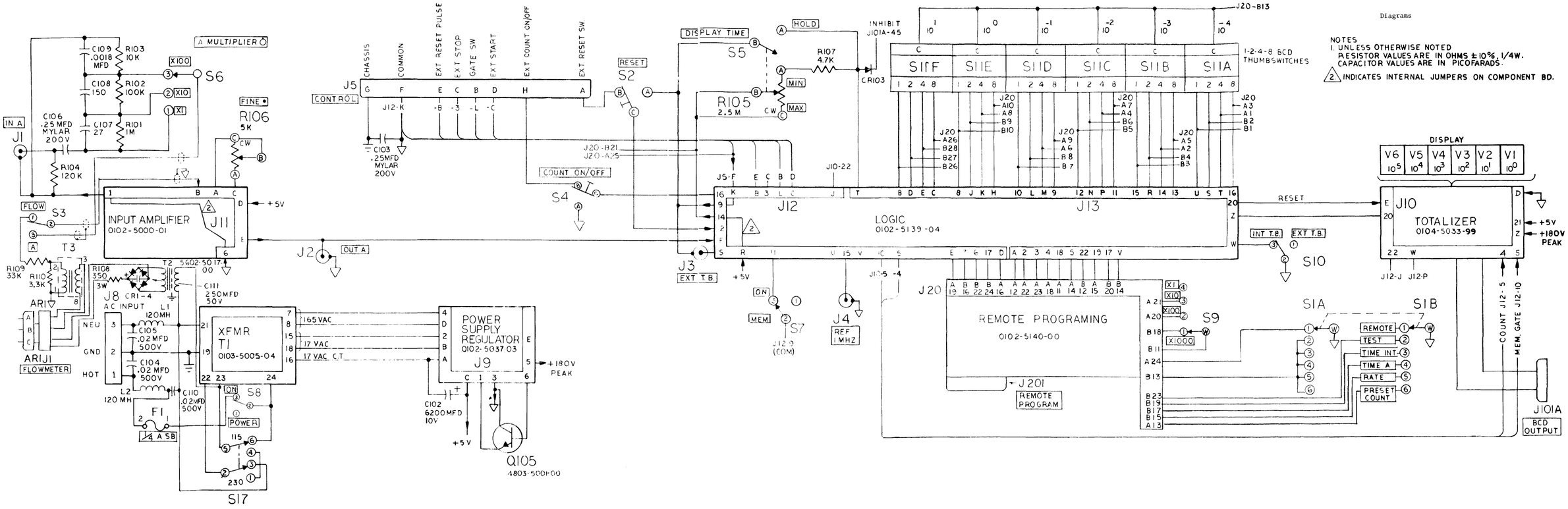
SCALE —
FINISH —

COMPONENT BOARD,
POWER SUPPLY REGULATOR

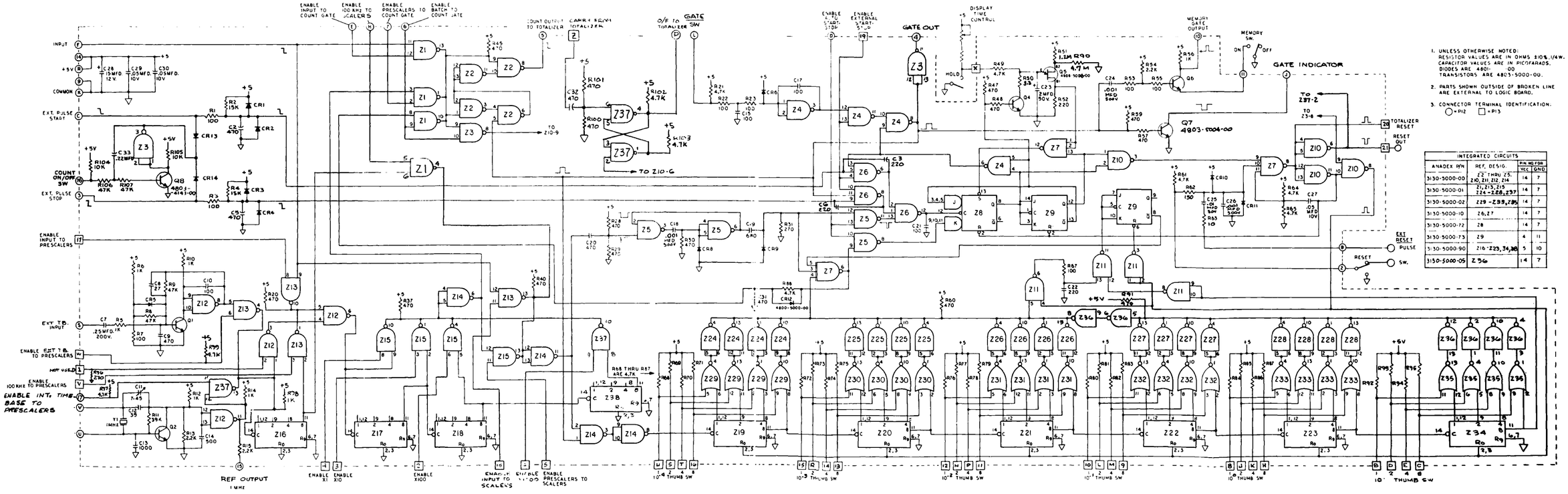
DATE	DRAWN	CHECKED	APPROVED	DWG NO.
11-18-69	CS	WC	DQ 12-69	1700-5037-03

SHEET 1 OF 4

1700-5037-03



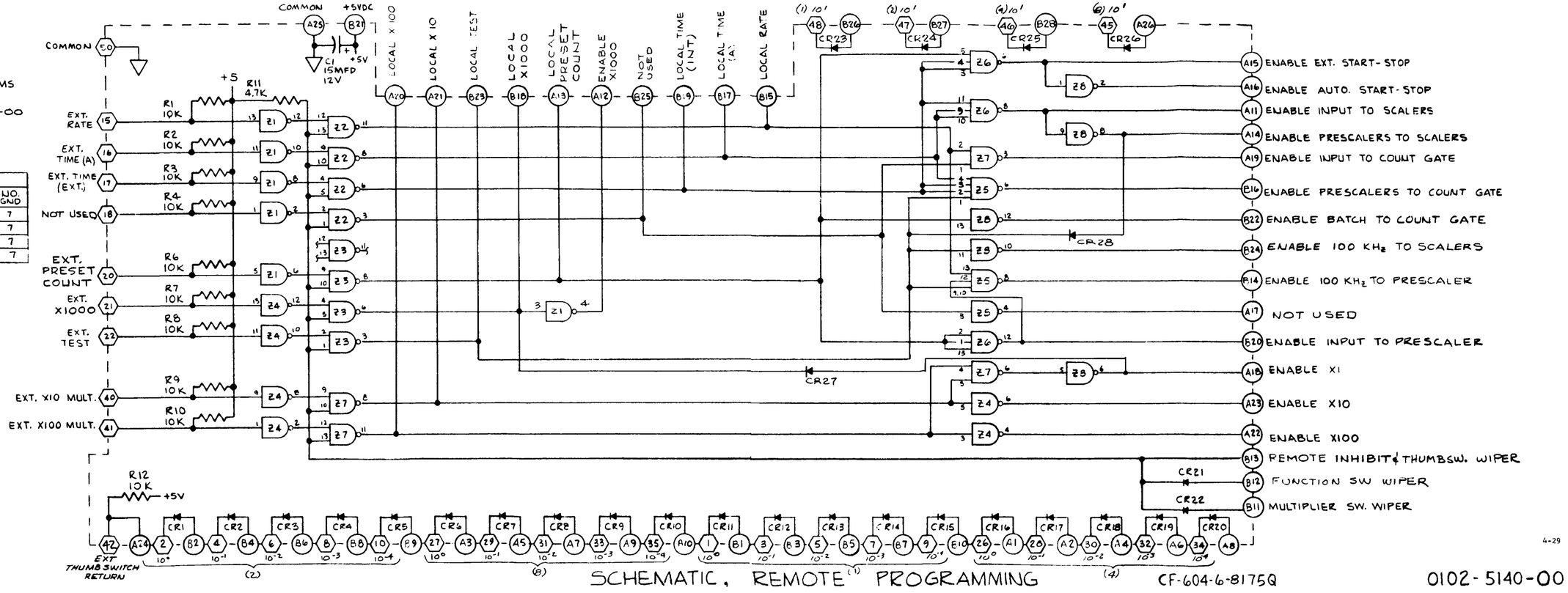
CF-604-6-8175Q
CHASSIS INTERCONNECTION DIAGRAM 01005097-03A



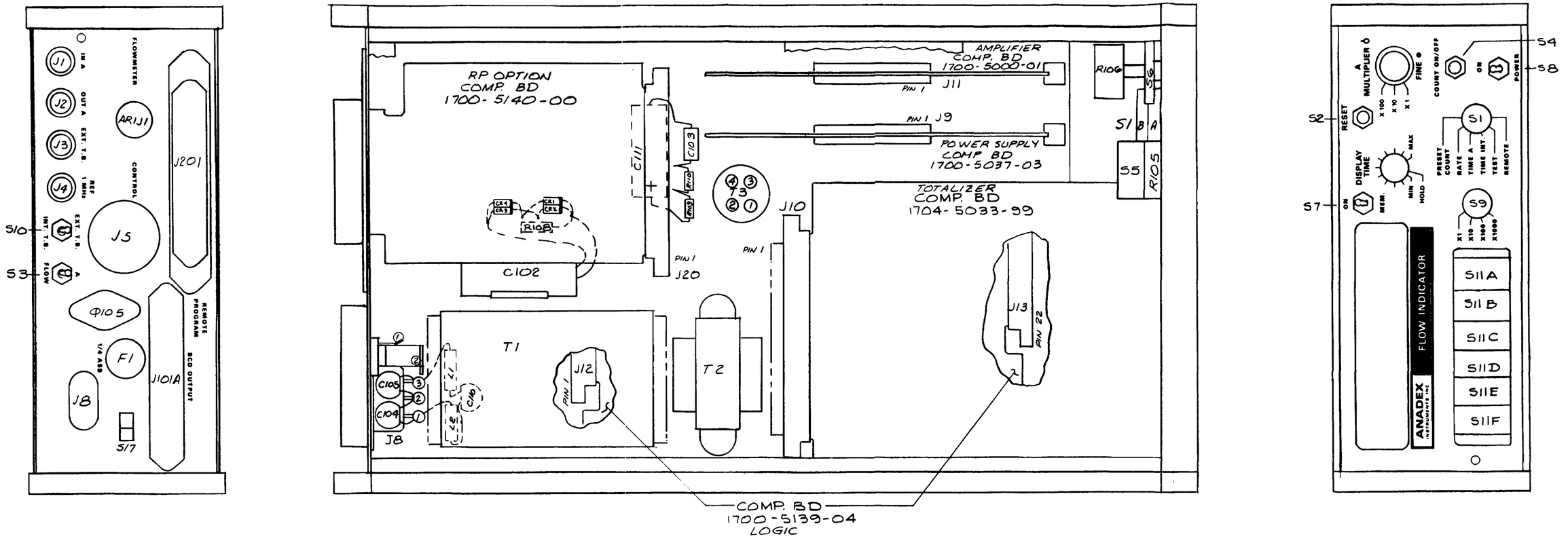
SCHEMATIC, LOGIC CF-604-6-8175Q 0102-5139-04A

NOTES:
1. UNLESS OTHERWISE NOTED
RESISTOR VALUES ARE IN OHMS
±10% ¼ W
DIODES ARE 4805-5000-00
2. ⬡ = J102 CONNECTOR
◯ = P20 CONNECTOR

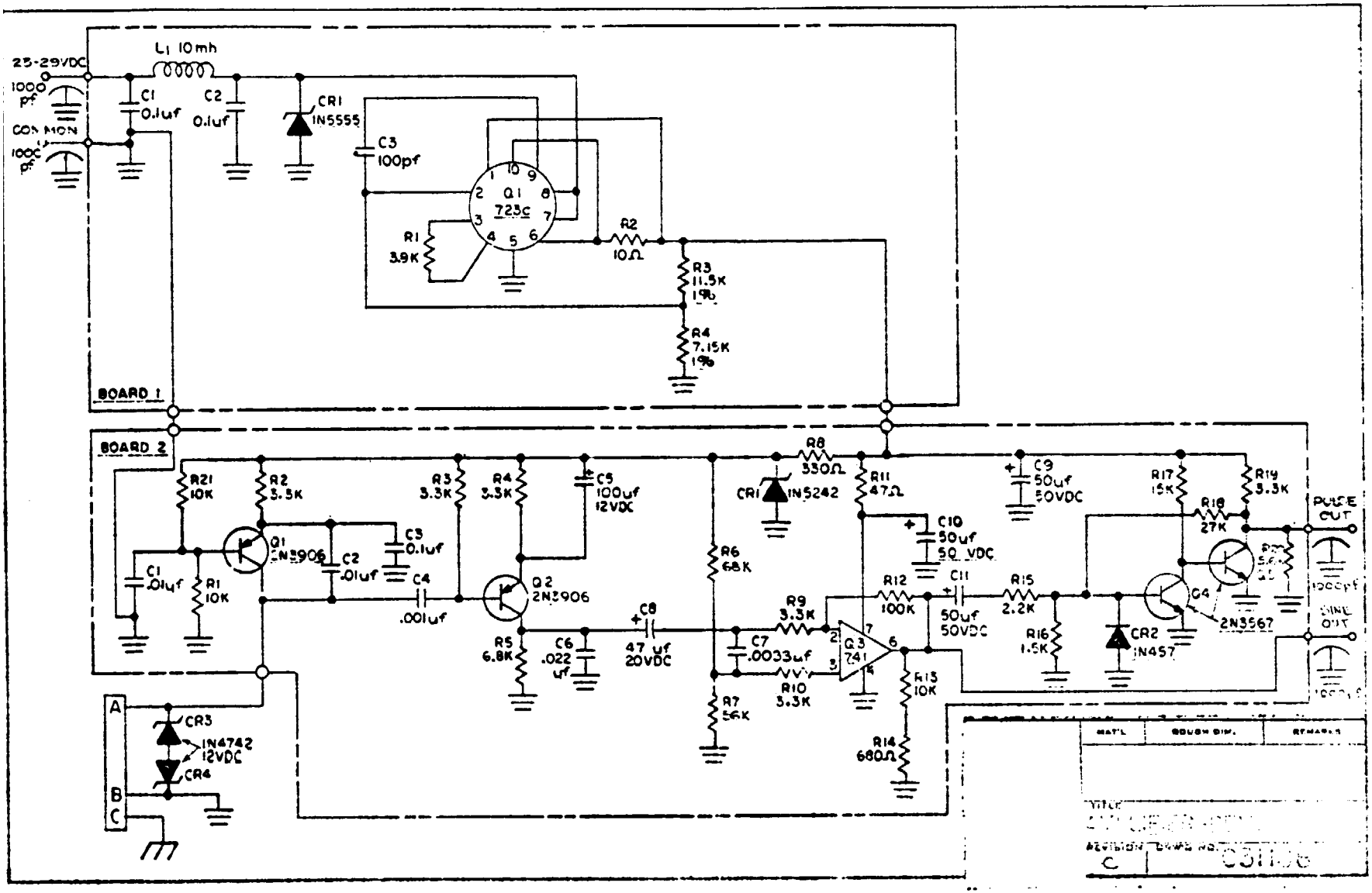
INTEGRATED CIRCUITS			
REF. DES.	ANADEX P/N	PIN NO. V_{CC}	PIN NO. GND
Z2,3,7	3130-5001-00	14	7
Z6	3130-5001-01	14	7
Z1,4,8	3130-5001-02	14	7
Z5	3130-5001-05	14	7



SCHEMATIC, REMOTE PROGRAMMING CF-604-6-8175Q 0102-5140-00



COMPONENT LOCATION CF-604-6-8175Φ 0100-5097-01 4-39


25-29VDC
1000 pf
COMMON
1000 pf
L1 10mh
C1 0.1uf
C2 0.1uf
CR1 IN5555
C3 100pf
Q1 723c
R1 3.9K
R2 10Ω
R3 11.5K 1%
R4 7.15K 1%
BOARD 1
BOARD 2
R21 10K
R2 3.5K
Q1 2N3906
C3 0.1uf
C2 .01uf
C1 .01uf
R1 10K
C4 .001uf
R3 3.3K
R4 3.3K
C5 100uf 12VDC
Q2 2N3906
R5 6.8K
C6 .022 uf
C8 47 uf 20VDC
R6 68K
R7 56K
R8 330Ω
CR1 IN5242
R9 3.3K
C7 .0033uf
R10 3.3K
Q3 741
R11 47Ω
R12 100K
C10 50uf 50 VDC
C11 50uf 50VDC
R13 10K
R14 680Ω
C9 50uf 50VDC
R15 2.2K
R16 1.5K
CR2 IN457
R17 15K
R18 27K
R19 3.3K
Q4 2N3567
PULSE OUT
SINE OUT
A
B
C
CR3 IN4742 12VDC
CR4
MATL
ROUGH DIM.
REMARKS
REVISION
C

MFG's Part Number	Page Location	Quantity End Item	Mfg. Code	Item/Seq
AC-3G	16	1	82839	A1600
AK-30	18	1	88557	A1730
AMS-3655	3	AR	9H503	A0300
AMS-3655	7	AR	9H503	A0630
AN515-3-R6	16	6	88044	A1510
AN515-3-R6	27.1	REF	88044	A2670
AN935-3L	16	6	88044	A1550
AN935-3L	28	REF	88044	A2730
AN960-4	16	6	96906	A1540
BR-250-50	26	1	14655	A2590
BWH-10%-2W-0.33Ω	10	1	75042	A0980
CB1001	2	27	01121	A0150
CB1001	4	REF	"	A0350
CB1011	4	10	"	A0340
CB1011	12	REF	“	A1170
CB1021	4	10	"	A0390
CB1021	9	REF	"	A0900
CB1021	12	REF	“	A1190
CB1031	5	15	“	A0461
CB1031	10	REF	"	A0940
CB1031	13	REF	“	A1250
CB1031	15	REF	“	A1410
CB1031	22	REF	“	A2130
CB1041	10	2	"	A0950
CB1041	22	REF	"	A2120
CB1051	22	1	“	A2110
CB1241	22	1	"	A2140
CB1251	5	1	"	A0450
CB1521	12	1	“	A1200
CB1531	5	2	“	A0440
CB1821	2	25	“	A0160
CB1841	10	1	"	A0960
CB2211	4	1	"	A0360
CB2221	4	7	"	A0400
CB2221	10	REF	"	A0910
CB2221	13	REF	"	A1210
CB2231	2	5	"	A0180
CB2231	13	REF	“	A1260
CB27GI	9	1	"	A0860
CB2711	4	3	"	A0370
CB2711	9	REF	“	A0880
CB33G1	4	1	"	A0330
CB3311	9	1	"	A0890
CB3321	10	2	01121	A0920
CB3321	27.0	REF	"	A2640
CB3331	13	2	"	A1270

MFG's Part Number	Page Location	Quantity End Item	Mfg. Code	Item/Seq
CB3331	27.0	REF	01121	A2630
CB3921	13	1	"	A1220
CB3925	2	6	"	A0170
CB3931	5	1	"	A0420
CB4711	4	17	"	A0380
CB4711	12	REF	"	A1180
CB4721	5	40	"	A0410
CB4721	10	REF	"	A0930
CB4721	13	REF	"	A1230
CB4721	14	REF	"	A1400
CB4721	19	REF	"	A1890
CB4731	5	4	"	A0420
CB4751	5	1	"	A0460
CB6831	13	1	"	A1280
CB8201	9	1	"	A0870
CB8221	13	1	"	A1240
CF-604-6-8175Q	1	1	14010	A0010
C11374-440-4	26	2	78553	A2540
C11715	27.0	1	18316	A2662
C31206	27.0	1	18316	A2661
C50653	27.0	1	18316	A2660
DHN-13	21	4	07126	A2060
DM15-102J	6	1	84171	A0550
DM15-390J	6	1	84171	A0560
DM15-501J	6	1	84171	A0570
EB4701	10	1	01121	A0970
MBP203Z5U500M(KLAC)	18	3	⚠1	A1760
MBP-472Z5V500Z	13	2	⚠1	A1300
MJE340	12	1	04713	A1110
MPS2369	7	4	04713	A0670
MST105D	20	4	95146	A1990
MS24621-9	3	1	88044	A0260
MS24693-S2	27.1	2	88044	A2690
MS24693-S3	27.1	5	88044	A2700
MS24693-S6	28	6	88044	A2710
MS24693-S48	28	2	88044	A2720
MS3102A-18-1P	16	1	13511	A1570
MS35206-202	27.1	2	88044	A2680
MS35206-212	24	6	88044	A2370
MS35206-213	24	5	88044	A2380
MS35206-214	24	4	88044	A2390
MS35206-216	8	6	88044	A0800
MS35206-216	25	REF	88044	A2410
MS35206-218	24	10	88044	A2400
MS35206-227	25	12	88044	A2430
MS35206-228	25	12	"	A2420
MS35206-229	25	1	"	A2440
MS35214-28	25	4	"	A2450

MFG's Part Number	Page Location	Quantity End Item	Mfg. Code	Item/Seq
MS35338-36	25	2	88044	A2500
MS35338-39	26	6	"	A2570
MS35338-40	9	37	"	A0820
MS35338-40	25	REF	"	A2490
MS35338-41	26	29	"	A2510
MS35338-42	28	2	88044	A2740
NAS43DDI-18	23	4	80205	A2210
NAS620-2	26	6	80205	A2530
NAS620-3L	16	30	"	A1530
NAS620-3L	28	REF	"	A2760
NAS620-4L	9	46	"	A0810
NAS620-4L	25	REF	"	A2470
NAS620-6L	25	27	"	A2480
NAS620-8L	28	2	"	A2750
NAS671-2	26	4	"	A2580
NAS671-3	16	2	"	A1520
NAS671-4	9	28	"	A0830
NAS671-4	26	REF	"	A2550
NAS671-6	26	3	"	A2560
NAS671-8	28	2	80205	A2770
NL1221	3	6	83781	A0240
No. 2	8	2	08547	A0790
0-4	23	1	80223	A2220
PS-50D-2	19	1	21604	A1830
PS-50D-2 short	19	2	21604	A1820
PS-50L-1 short	19	1	21604	A1840
PS-70-CL-2	19	1	21604	A1850
RT224Z5V102Z(KLAC)	6	1	⚠1	A0571
SN15830N	15	1	01295	A1440
SN15836N	15	3	01295	A1450
SN15846N	15	3	01295	A1470
SN15862N	15	1	01295	A1460
SN7400N	7	8	01295	A0700
SN7401N	8	9	01295	A0710
SN7402N	8	6	01295	A0720
SN7405N	7	1	01295	A0690
SN7410N	8	2	01295	A0730
SN74141N	3	6	01295	A0210
SN7472N	8	1	01295	A0740
SN7473N	8	1	01295	A0750
SN7475N	3	7	01295	A0220
SN7490N	2	16	01295	A0200
SN7490N	8	REF	01295	A0760
SS101Y5S102K(KLAC)	6	4	⚠1	A0510
SS102Y5S500K(KLAC)	5	4	⚠1	A0470
SS102Y5S500K(KLAC)	11	REF	⚠1	A1010

MFG's Part Number	Page Location	Quantity End Item	Mfg. Code	Item/Seq
SS151X5S102K(KLAC)	22	1	⚠1	A2170
SS182Y5S500K(KLAC)	11	2	⚠1	A1020
SS182Y5S500K(KLAC)	22	REF	⚠1	A2180
SS221X5P102K(KLAC)	6	3	⚠1	A0520
SS471Y5S102K(KLAC)	6	6	⚠1	A0530
SS681Y5S102K(KLAC)	6	1	⚠1	A0540
TBP103Z5V050M(KLAC)	5	3	⚠1	A0480
TC270N75D102K(KLAC)	5	2	⚠1	A0500
TC270N750102K(KLAC)	22	REF	⚠1	A2160
TC509N1500102K(KLAC)	13	1	⚠1	A1290
TE1129	2	4	56289	A0190
TE1129	6	REF	56289	A0580
TE1129	11	REF	56289	A1030
TE1129	15	REF	56289	A1420
TI575	14	1	01295	A1340
TNT205U050P1A	6	1	90201	A0600
UG-1094/U	18	4	13511	A1710
UK10-503	5	5	88557	A0490
UK10-503	10	REF	88557	A1000
XA2C254	6	3	27556	A0590
XA2C254	18	REF	27556	A1770
XA2C254	22	REF	27556	A2150
X-201-25K	11	1	11237	A1050
X-201-250	11	1	11237	A1040
01-12261D01	27.0	1	18316	A2663
01-12264D01	27.0	1	18316	A2664
05-3303	12	10	11769	A1140
05-3303	14	REF	11769	A1370
0800-5000-00	12	1	14010	A1160
0800-5033-00	2	1	14010	A0140
0800-5037-00	9	1	14010	A0850
0800-5139-00	4	1	14010	A0320
0800-5140-00	14	1	14010	A1390
1N2070	11	1	81349	A1070
1N270	7	29	81349	A0650
1N270	15	REF	81349	A1430
1N4148	7	16	81349	A0640
1N4148	11	REF	81349	A1080
1N4148	26	REF	81349	A2600
1N4816	11	2	81349	A1060
1N746A	11	1	81349	A1090
10022-N	26	4	2H088	A2520
10099-N	8	1	2H088	A0761
12C1087	22	2	81073	A2190
1204-005	4	1	06656	A0321
1250V	20	2	23880	A1960
1400-5005-24	20	2	14010	A1950
1400-5040-02	1	1	14010	A0030
1400-5043-01	1	2	"	A0040

MFG's Part Number	Page Location	Quantity End Item	Mfg. Code	Item/Seq
1400-5058-41	1	1	14010	A0050
1400-5060-01	1	1	14010	A0060
1400-5060-03	1	1	14010	A0070
1400-5192-01	2	1	14010	A0110
1400-5192-02	1	1	14010	A0100
1404-5099-00	2	1	14010	A0120
1404-5100-00	1	1	14010	A0090
1409-5004-00	20	1	14010	A1940
1409-5004-01	20	1	14010	A1930
1409-5004-02	20	1	14010	A1920
1409-5004-03	20	2	14010	A1910
1412-6	24	1	83330	A2340
1700-5000-03	12	1	14010	A1150
1700-5037-03	9	1	14010	A0840
1700-5139-04	4	1	14010	A0310
1700-5140-00	14	1	14010	A1380
1704-5033-99	2	1	14010	A0130
17258-S	23	1	70903	A2260
2N3569	11	3	81349	A1100
2N3643	7	5	81349	A0681
2N3643	14	REF	81349	A1350
2N3644	12	3	81349	A1120
2N4410	3	2	81349	A0230
2N4410	7	REF	81349	A0660
2N6028	7	1	81349	A0680
2VK6D/1-2	17	2	05574	A1620
2VK6D/1-2	17	REF	05574	A1700
2VK18D/1-2	17	1	05574	A1640
2VK22D/1-2	17	2	05574	A1660
2VK22D/1-2	17	REF	05574	A1680
2007	18	1	71785	A1790
21C10AA622	18	1	99392	A1780
2103-5000-03	17	1	14010	A1630
2103-5001-01	17	1	14010	A1690
2103-5001-02	17	1	14010	A1610
2103-5003-01	17	1	14010	A1670
2103-5003-02	17	1	14010	A1650
2103-5037-01	16	1	14010	A1580
2107-4002-01	12	10	14010	A1130
2107-4002-01	14	REF	14010	A1360
2300-4587-00	8	1	14010	A0780
2-45002-6	21	2	07126	A2050
2500-3056-00	19	1	14010	A1860
2500-5159-03	15	1	14010	A1870
2500-5250-00	15	1	14010	A1480
2509-5097-00	28	1	14010	A2780

MFG's Part Number	Page Location	Quantity End Item	Mfg. Code	Item/Seq
26T/copper	3	AR	9H503	A0290
26T/copper	7	REF	"	A0620
28-12069N02	27.1	1	02660	A2665
2803-0010-01	24	2	14010	A2330
2890-44	27.0	2	99800	A2650
3VH28/1JN5	16	1	05574	A1590
3X350	27.0	1	63743	A2620
3X5000	10	2	63743	A0990
3100-5001-00	23	1	14010	A2270
3100-5004-00	23	1	14010	A2250
313.250	22	1	75915	A2200
314-AG5D-2	3	52	91506	A0270
314-AG5D-2	8	REF	91506	A0770
314-AG5D-2	15	REF	91506	A1500
3150-5002-22	23	1	14010	A2290
3150-5002-25	23	1	"	A2300
3150-5002-32	24	1	"	A2310
3150-5002-35	24	1	14010	A2320
316AG5D-2	3	13	91506	A0270
342004	18	1	75915	A1720
3800-5001-12	19	1	14010	A1880
3908-5003-03	3	1	14010	A0250
4	18	4	71002	A1740
40250	23	1	86684	A2280
4521-112-100-2C	24	1	86928	A2360
46256LF	20	1	82389	A1970
4751-5000-00	19	1	14010	A1900
4801-2542-00	27.0	1	14010	A2610
5001-4	21	1	81073	A2010
5002-6	20	1	"	A2000
5101-5000-00	21	1	14010	A2090
5101-5000-01	21	1	14010	A2100
5103-5004-02	21	1	14010	A2020
52A	19	1	71785	A1810
55A	18	1	"	A1800
5602-5000-04	23	1	14010	A2230
5602-5017-00	23	1	14010	A2240
5606-28-32	18	4	86928	A1750
5710-63	25	2	86928	A2460
57-40500	15	2	13511	A1490
57-40500	16	REF	13511	A1560
6513-C	24	4	72653	A2350
76F02BM471	14	1	01002	A1330
76F02CK151	14	2	01002	A1310
76F02EB221	14	1	01002	A1320
8000-5097-00	1	1	14010	A0020

MFG's Part Number	Page Location	Quantity End Item	Mfg. Code	Item/Seq
8-06001	21	1	07126	A2040
8-06002	21	1	“	A2030
8114	21	5	“	A2070
8114w/w.Dot	21	1	“	A2080
825-BN	7	1	88557	A0610
963	20	2	82389	A1980

⚠1 Dilectron, Monrovia, Calif. - .No Federal Code Number Assigned.

Section VI

PARTS LIST

6.1 Ordering Information

To obtain replacement parts, find the manufacturer's part number and description in this manual and then refer to the appropriate Repair Parts and Special Tools List (RPSTL) T'M. In the RPSTL, find the assembly or subassembly first and then the description) in which corresponds ,with that in this manual. Under the description in the RPSTL find the manufacturer's part number, and then order the part by the listed Federal Stock Number. If the part is not listed in the RPSTL, it should be requisitioned from the NICP in accordance with AR 725-50.

6.2 PARTS LIST FOR MIS-10391A

1" METER

ITEM	NAME	P/N	QTY	FEDERAL MFGR CODE
1	CONNECTOR	12070 12097	1	08051
2	PICK-OFF	31199	1	18316
3	LOCKNUT	10036	1	18316
4	RETAINER	11711	2	18316
5	HOUSING	31198	1	18316
6	SUPPORT DOWN	31194-2	1	18316
7	CONE	11710	2	18316
8	RETAINER	11530	2	18316
9	BEARING	10753	2	83086
10	ROTOR	31169-18	1	18316
11	SHAFT	10184-2	1	18316
12	SUPPORT UP	31194-1	1	18316
13	SPACER	10183	3	18316

1/2" METER

ITEM	NAME	P/N	QTY	FEDERAL MFGR CODE
1	CONNECTOR	12070 12097	1 1	08051
2	PICK-OFF	31199	1	18316
3	LOCKNUT	10036	1	18316
4	RETAINER	10820	2	18316
5	HOUSING	31219	1	18316
6	SUPPORT DOWN	11702-2B	1	18316
7	CONE	11703	2	18316
8	RETAINER	10017	2	18316
9	BEARING	10823	2	83086
10	ROTOR	31166-15	1	18316
11	SHAFT	10907-2	1	18316
12	SUPPORT UP	11702-2A	1	18316

6.3 1 YEAR PROVISIONING REQUIREMENTS

NAME	P/N	QTY	FEDERAL MFGR CODE
PICK-OFF	31199	1	18316
RETAINERS- 1/2" HOUSING	10820	2	18316
RETAINERS - 1" HOUSING	11711	2	18316
BEARING - 1/2"	10823	4	83086
BEARING - 1"	10753	4	83086
RETAINERS - 1/2" BEARING	10017	4	18316
RETAINERS - 1" BEARING	11530	4	18316
SPACERS - 1"	10183	2	18316
SUPPORTS DOWNSTREAM - 1/2"	11702-2B	1	18316
SUPPORTS DOWNSTREAM - 1"	31194-2	1	18316
SUPPORTS UPSTREAM -1/2"	11702-2A	1	18316
SUPPORTS UPSTREAM -1"	31194-1	1	18316

6.4 PARTS LIST FOR FLOW INDICATOR

SYMBOL NO. PREFIX OR UNIT NOMENCLATURE — COMPONENT PARTS AND PROVISIONING LIST

ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4	PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15 / FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0010	A		Flow Indicator 14010	 CF-604-6-8175Q		1 0000	 0000	1	IND		2475	00				6
A0020	B		Flow Inc. Assy. 14010	 8000-5097-00		1 0000	 0000	1	IND							
A0030	C		Shear PT. Cab. 14010	 1400-5040-02		1 0000	 0000	1	IND		2	10				1
A0040	C		Cover Side 14010	 1400-5043-01		2 0000	 0000	2	IND		1	95				1
A0050	C		Panel, Front Mach. 14010	 1400-5058-41		1 0000	1 0000		IND		1	70				2
A0060	C		Side Assy. Cab. R. H. 14010	 1400-5060-01		1 0000	 0000	1	IND		14	50				2
A0070	C		Side Assy. Cab. L. H. 14010	 1400-5060-03		1 0000	 0000	1	IND		13	95				2
A0080	C		Chassis 14010	 1400-5190-02		1 0000	 0000	1	IND		6	75				2
A0090	C		Panel Assy.,Rear Marked 14010	 1404-5100-00		1 0000	 0000	1	IND		79	20				2
A0100	C		Cover Assy. ,Top 14010	 1400-5192-02		1 0000	 0000	1	IND		3	81				2

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4	PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21	SPARES ALLOCATIONS 22					LT 23
A0110	C		Cover, Bottom	14010	1400-5192-01		1 0000	0000	1	IND		2	10			2
A0120	C		Panel, Front Mkd	14010	1404-5099-00		1 0000	0000	1	IND		81	20			2
A0130	C		Bd. Comp., Totalizer	14010	1704-5033-99		1 0010	0010	1	36		195	00			2
A0140	D		Board, P.C.	14010	0800-5033-00		1 0000	0000	1	36		30	60			1
A0150	D	R2-5	Res. Carb. Comp.	01121	4700-0100-12 CB1001		25 0000	0000	27	60			06			1
A0160	D	R6-9	Res. Carb. Comp.	01121	4700-0182-12 CB1821		25 0000	0000	25	60			06			1
A0170	D	R1	Res. Carb. Comp.	01121	4700-0392-32 CB3925		6 0010	0020	6	60			10			1
A0180	D	R10-12	Res. Carb. Comp	01121	.4700-0223-12 CB2231		3 0010	0010	5	60			06			1
A0190	D	C1	Cap. Elect.	56289	1502-5156-03 TE1129		1 0000	0010	4	36		1	50			1
A0200	D	Z1	IC Dec. Cntr.	01295	3130-5000-90 SN7490N		6 0020	0020	16	36		3	90			1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0210	D	Z3	IC Display Driv.	01295	3130-5000-41 SN74141N		6 0020	0020	6	36		3	9				1
A0220	D	Z2	IC, Latch	01295	3130-5000-75 SN7475N		7 0020	0020	7	36		3	90				1
A0230	D	Q1	Transistor	81349	4803-5004-00 2N4410		1 0010	0010	2	36		1	00				1
A0240	D	V1-6	Tube, Readout	83781	5700-5012-01 NL1221		6 0020	0020	6	36		10	00				1
A0250	D	DS1, DS3	Indicator, Assy.	14010	3908-5003-03		1 0000	0000	1	36		2	17				1
A0260	D		Screw, Self Tap.	88044	2800-0300-09 MS24621-9		1 0000	0000	1	IND			10				1
A0270	D	XZ1	Socket, IC, 14 Pin	91506	2107-5000-00 314-AG5D-2		6 0000	0010	52	48			75				1
A0280	D	XZ2, 3	Socket, IC, 16 Pin	91506	2107-5001-00 316-AG5D-2		13 0000	0020	13	48			35				1
A0290	D		Wire, Solid	9H503	26T/Copper		AR 0000	0000	AR	IND							1
A0300	D		Insul. Sleeving	9H503	AMS-3655		AR 0000	0000	AR	IND							1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FO R OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	PRIME CONTRACTORS LONG PART NO. CODE 5	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	MANUFACTURES LONG PART NO. CODE 17	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0310	C		Bd. Comp.	Logic 14010	1700-5139-04		1 0010	0010	1	36		270	00				2
A0320	D		Board, P. C.	14010	0800-5139-00		1 0000	0000	1	36		26	70				2
A0321	D		P. C. Subelement	06656	0809-5000-00 1204-005		1 00010	0000	1	24			40				1
A0330	D	R50	Res. Carb.	Comp. 01121	4700-1330-12 CB33G1		1 0000	0000	1	60			06				1
A0340	D	R1, 3, 7, 22, 23, 53, 55, R67	Res. Carb.	Cornp. 01121	4700-0101-12 CB1011		8 0000	0000	10	60			06				1
A0350	D	R42, 63	Res. Carb.	Comp. 01121	4700-0100-12 CB1001		2 REF	REF	REF								
A0360	D	R52	Res. Carb.	Comp. 01121	4700-0221-12 CB2211		1 0000	0000	1	60			06				1
A0370	D	R31, 96	Res. Carb.	Comp. 01121	4700-0271-12 CB2711		2 0000	0000	3	60			06				1
A0380	D	R20, 28-30, 37, 40, 45 47, 48, 57, 59, 60, 91	Res. Carb.	Comp. 01121	4700-0471-12 CB4711		15 0000	0000	17	60			06				1
A0390	D	R5, 6, 10, 12, 14, 56, 98	Res. Carb.	Comp. 01121	4700-0102-12 CB1021		7 0000	0000	10	60			06				1

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0400	D	R13, 15, 54	Res. Car.	Comp. 01121	4700-0222-12 CB2221		3 0000	0000	7	60			06				1
A0410	D	R21, 49, 61, 64, 65, 68-88, 92-95, 97, 99, 102,	Res. Carb.	Comp. 01121	4700-0472-12 CB4721		34 0000	0000	40	60			06				1
A0420	D	R11	Res. Carb.	Comp. 01121	4700-0393-12 CB3931		1 0000	0000	1	60			06				1
A0430	D	R8, 9, 106, 107	Res. Carb.	Comp. 01121	4700-0473-12 CB4731		4 0000	0000	4	60			06				1
A0440	D	R2, 4	Res. Carb.	Comp. 01121	4700-0153-12 CB1531		2 0000	0000	2	60			06				1
A0450	D	R51	Res. Carb:.	Comp. 01121	4700-0125-12 C21251		1 0000	0000	1	60			06				1
A0460	D	R90	Res. Carb.	Comp. 01121	4700-0475-12 CB4751		1 00O0	0000	1	60			06				1
A0461	D	R104, 105	Res. Carb.	Comp. 01121	4700-0103-12 CB1031		2 0000	0000	15	60			06				1
A0470	D	C18, 24, 26	Cap. Disc		1500-4102-41 SS102Y5S500K(KLAC)		3 0000	0000	4	IND			40				Dilectron Monrovia, Ca.
A0480	D	C25	Cap. Disc		1500-6103-11 TBP103Z5V050M(KLAC)		1 0000	0000	1	IND			40				1 "

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0490	D	C27, 29, 30	Cap. Disc	88557	1500-5000-00 UK10-503		3 0000	0000	5	IND			40				1
A0500	D	C8	Cap. Disc.		1500-4270-52 TC270N750102K(KLAC)		1 0000	0000	2	IND			40				1 Dilectron Monrovia, Ca.
A0510	D	C10, 15, 17, 21	Cap. Disc		1500-4101-51 SS101Y5S102K(KLAC)		4 0000	0000	4	IND			40				1 "
A0520	D	C3, 6, 22	Cap. DIsc		1500-4221-51 SS221X5P102K(KLAC)		3 0000	0000	3	IND			40				1 "
A0530	D	C2, 5, 9, 20, 31, 32	Cap. Disc		1500-4471-51 SS471Y5S102K(KLAC)		6 0000	0000	6	IND			40				1 "
A0540	D	C19	Cap. Disc		1500-4681-51 SS681Y5S102K(KLAC)		1 0000	0000	1	IND			40				1 "
A0550	D	C13	Cap. Silver Mica	84171	1505-3102-12 DM15-102J		1 0000	0000	1	IND		1	50				1
A0560	D	C12	Cap. Silver Mica	84171	1505-3390-42 DM15-390J		1 0000	0000	1	IND		1	50				1
A0570	D	C14	Cap. Silver Mica	84171	1505-3501-22 DM15-501J		1 0000	0000	1	IND		1	50				1
A0571	D	C33	Cap. Disc		1500-5001-00 RT224Z5V102Z(KLAC)		1 0000	0000	1	IND			40				1 "

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0580	D	C28	Cap. Elect.	56289	1502-5156-03 TE1129		1 REF	REF	REF								
A0590	D	C7	Cap. Mylar	27556	1506-5254-21 XA2C54		1 0000	0000	3	IND		1	62				1
A0600	D	C23	Cap. Tant.	90201	1503-6205-50 TNT205U050P1A		1 0010	0010	1	36		3	30				1
A0610	D	C11	Cap. Trim.	88557	1509-5000-00 825-BN		1 0000	0000	1	IND		1	50				1
A0620	D		Wire, Solid	9H503	26T/Copper		AR REF	REF	REF								REF
A0630	D		Insul. Sleeving	9H503	AMS-3655		AR REF	REF	REF								"
A0640	D	CR1-6, 8-11, 13, 14	Diode, Silicon	81349	4801-5005-00 1N4148		12 0010	0010	16	IND			50				1
A0650	D	CR12	Diode, Germ.	81349	4800-5000-00 1N270		1 0010	0010	29	IND			50				1
A0660	D	Q7	Transistor, NPN	81349	4803-5004-00 2N4410		1 REF	REF	REF								
A0670	D	Q1, 2, 4, 6	Transistor, NPN	04713	4803-5000-00 MPS2369		4 0010	0010	4	IND							1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4	PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21	SPARES ALLOCATION S 22					LT 23
A0680	D	Q5	Transistor, UJT	81349	4808-5003-00 2N6028		1 0000	0000	1	IND	3	90				1
A0681	D	Q8	Transistor, NPN	81349	4803-4143-00 2N3643		1 0010	0010	5	IND	1	60				1
A0690	D	Z36	IC, Hex. Inv., CC.	01295	3130-5000-05 SN7405N		1 0010	0010	1	IND	2	40				1
A0700	D	Z2-5, 10-12, 14	IC Gate	01295	3130-5000-00 SN7400N		8 0020	0020	8	IND	2	40				1
A0710	D	Z1, 13, 15, 24-28, 37	IC Gate	01295	3130-5000-01 SN7401N		9 0020	0020	9	IND	2	40				1
A0720	D	Z29-33, 35	IC Gate	01295	3130-5000-02 SN7402N		6 0020	0020	6	IND	2	40				1
A0730	D	Z6, 7	IC Gate	01295	3130-5000-10 SN7410N		2 0010	0010	2	IND	2	40				1
A0740	D	Z8	IC J-K FF	01295	3130-5000-72 SN7472N		1 0010	0010	1	IND	2	75				1
A0750	D	Z9	IC Dual J-K FF	01295	3130-5000-73 SN7473N		1 0010	0010	1	IND	3	20				1
A0760	D	Z16-23, 34, 38	IC Dec. Cntr.	01295	3130-5000-90 SN7490N		10 REF	REF	REF							

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0761	D		Transipad (for Q8)	2H088	4809-5010-04 10099-N		1 0000	0000	1	IND			40				1
A0770	D	XZ1-XZ38	Socket, IC, 14 Pin	91506	2107-5000-00 314-AGSD-2		38 REF	REF	REF								
A0780	D	Y1	Crystal, 1 MHz	14010	2300-4587-00		1 0000	0000	1	IND			35	40			1
A0790	D		Washer Fit. Nyl.	08547	2802-9010-02 No. 2		2 0000	0000	2	IND			25				1
A0800	D		Screw, Machine	88044	2800-0002-16 MS35206-216		2 0000	0000	6	IND			10				1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0810	D		Washer, Flat #4	80205	2802-0030-04 NAS620-4L		2 0000	0000	46	IND			10				1
A0820	D		Washer, Lock #4	88044	2802-0210-40 MS35338-40		2 0000	0000	37	IND			10				1
A0830	D		Nut, Hex. 4-40	80205	2801-0000-04 NAS671-4		2 0000	0000	28	IND			10				1
A0840	C		Bd. Comp. Pwr. Sply.	14010	1700-5037-03		1 0010	0010	1	48		56	00				2
A0850	D		Bd., PC. Pwr. Sply.	14010	0800-5037-00		1 0000	0000	1	IND		12	96				2
A0860	D	R4	Res. Carb. Comp	01121	4700-1270-12 CB27G1		1 0000	0000	1	60			06				1
A0870	D	R16	Res. Carb. Comp	01121	4700-0820-12 CB8201		1 0000	0000	1	60			06				1
A0880	D	R8	Res. Carb. Comp	01121	4700-0271-12 CB2711		1 REF	REF	REF								
A0890	D	R10	Res. Carb. Comp	01121	4700-0331-12 CB3311		1 0000	0000	1	60			06				1
A0900	D	R15, 18	Res. Carb. Comp	01121	4700-0102-12 CB1021		1 REF	REF	REF								

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A0910	D	R7	Res. Carb.	Comp. 01121	4700-0222-12 CB2221		1 REF	REF	REF								
A0920	D	R3	Res. Carb.	Comp. 01121	4700-0332-12 CB3321		1 0000	0000	2	60			06				1
A0930	D	R13, 17, 20	Res. Carb.	Comp. 01121	4700-0472-12 CB4721		3 REF	REF	REF								
A0940	D	R11	Res. Carb.	Comp. 01121	4700-0103-12 CB1031		1 REF	REF	REF								
A0950	D	R14	Res. Carb.	Comp. 01121	4700-0104-12 CB1041		1 0000	0000	2	60			06				1
A0960	D	R1	Res. Carb.	Comp. 01121	4700-0184-12 CB1841		1 0000	0000	1	60			06				1
A0970	D	R19	Res. Carb.	Comp. 01121	4700-0470-13 EB4701		1 0000	0000	1	60			15				1
A0980	D	R12	Res. Wire Wnd, 2W	75042	4701-2330-11 BWH-10%-2W-0 33		1 0000	0000	1	IND			25				1
A0990	D	R5, 6	Res. Wire Wnd, 3W	63743	4701-0502-32 3X5000		2 0000	0000	2	IND			60				1
A1000	D	C4, 5	Cap. Disc.	88557	1500-5000-00 UK10-503		2 REF	REF	REF								

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1010	D	C2	Cap. Disc.		1502-4102-41		1		REF								Dilectron
					SS102Y5S500K(KLAC)		REF	REF									Monrovia, Ca.
A1020	D	C1	Cap. Disc.		1500-4182-41		1		2	IND			40				1 "
					SS182Y5S500K(KLAC)		0000	0000									
A1030	D	C3	Cap. Elect.		1502-5156-03		1		REF								
				56289	TE1129		REF	REF									
A1040	D	R9	Potentiometer		4750-5000-00		1		1	36		1	26				1
				11237	X-201-250Ω		0000	0000									
A1050	D	R2	Potentiometer		4750-5000-01		1		1	36		1	26				1
				11237	X-201-2.5K		0000	0000									
A1060	D	CR6, 7	Diode, Rect.		4801-5002-00		2		2	IND			95				1
				81349	1N4816		0000	0010									
A1070	D	CR3	Diode, Rect.		4801-5001-00		1		1	IND			95				1
				81349	IN2070		0000	0010									
A1080	D	CR5, 8, 9	Diode, Silicon		4801-5005-00		3		REF								
				81349	1N4148		REF	REF									
A1090	D	CR10	Diode, Zener		4802-5000-00		1		1	IND		1	10				1
				81349	1N746A		0000	0000									
A1100	D	Q2, 4, 5	Transistor, NPN		4803-4169-00		3		3	IND		1	60				1
				81349	2N3569		0020	0020									

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1110	D	Q3	Transistor, NPN	04713	4803-5002-00 MJE340		1 0010	0010	1	IND		3	30				1
A1120	D	Q1, 6, 7	Transistor, PNP	81349	4804-3126-00 2N3644		3 0020	0020	3	IND		1	60				1
A1130	D		Socket, Trans.	14010	2107-4002-01		6 0000	0000	10	48			75				1
A1140	E		Socket, Trans.	11769	2107-4002-00 05-3303		6 0000	0000	10	48			50				1
A1150	C		Bd., Comp. Amp	14010	1700-5000-03		1 0010	0010	1	48		50	50				1
A1160	D		Bd., P.C., Amp.	14010	0800-5000-00		1 0000	0000	1	IND		11	20				
A1170	D	R8, 10	Res. Carb. Comp.	01121	4700-0101-12 CB1011		2 REF	REF	REF								
A1180	D	R15, 18	Res. Carb. Comp.	01121	4700-0471-12 CB4711		2 REF	REF	REF								
A1190	D	R2, 3	Res. Carb. Comp.	01121	4700-0102-12 CB1021		2 REF	REF	REF								
A1200	D	R1	Res. Carb. Comp.	01121	4700-0152-12 CB1521		1 0000	0000	1	60			06				1

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1210	D	R7, 9, 17	Res. Carb.	Comp. 01121	4700-0222-12 CB2221		3 REF	REF	REF								
A1220	D	R4	Res. Carb.	Comp. 01121	4700-0392-12 CB3921		1 0000	0000	1	60			06				1
A1230	D	R16	Res. Carb.	Comp. 01121	4700-0472-12 CB4721		1 REF	REF	REF								
A1240	D	R13	Res. Carb.	Comp. 01121	4700-0822-12 CB8221		1 0000	0000	1	60			06				1
A1250	D	R6	Res. Carb.	Comp. 01121	4700-0103-12 CB1031		1 REF	REF	REF								
A1260	D	RS, 12	Res. Carb.	Comp. 01121	4700-0223-12 CB2231		2 REF	REF	REF								
A1270	D	R14	Res. Carb.	Comp. 01121	4700-0333-12 CB3331		1 0000	0000	2	60			06				1
A1280	D	R11	Res. Carb.	Comp. 01121	4700-0683-12 CB6831		1 0000	0000	1	60			06				1
A1290	D	C9	Cap. Disc.		1500-4050-53 TC509N1500102K(KLAC)		1 0000	0000	1	IND			40				1 Dilectron Monrovia, Ca.
A1300	D	C3, 4	Cap. Disc.		1500-6472-41 MBP-472Z5V500Z		2 0000	0000	2	IND			40				1 "

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1310	D	C5, 6	Cap. Elect.	01002	1502-5157-02 76F02CK151		2 0000	 0000	2	36		1	50				1
A1320	D	C7	Cap. Elect.	01002	1502-5227-03 76F02EM221		1 0000	 0000	1	36		1	50				1
A1330	D	C1	Cap. Elect.	01002	1502-5477-01 76F02BM471		1 0000	 0000	1	36		1	50				1
A1340	D	Q1	Transistor, FET	01295	4807-5000-00 TIS75		1 0020	 0020	1	IND		2	00				1
A1350	D	Q2-5	Transistor, NPN	81349	4803-4143-00 2N3643		4 REF	 REF	REF								
A1360	D		Socket, Trans.	14010	2107-4002-01		4 REF	 REF	REF								
A1370	E		Socket, Trans.	11769	2107-4002-00 05-3303		4 REF	 REF	REF								
A1380	C		Bd., Comp. Rem, Prog.	14010	1700-5140-00		1 0010	 0010	1	48		118	18				1
A1390	D		Bd., P. C. Rem. Prog.	14010	0800-5140-00		1 0000	 0000	1	IND		26	70				1
A1400	D	R11	Res. Carb. Comp.	01121	4700-0472-12 CB4721		1 REF	 REF	REF								

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	MANUFACTURES LONG PART NO. CODE 17	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22				LT 23
A1410	D	R1-4, 6-10, 12	Res. Carb. Comp.	01121	4700-0103-12 CB1031		10 REF	REF	REF							
A1420	D	C1	Cap. Elect.	56289	1502-5156-03 TE1129		1 REF	REF	REF							
A1430	D	CR1-28	Diode. Germ.	81349	4800-5000-00 1N270		28 REF	REF	REF							
A1440	D	Z5	IC Gate	01295	3130-5001-05 SN15830N		1 0010	0010	1	IND		2	40			1
A1450	D	Z1, 4, 8	IC Hex. Inv.	01295	3130-5001-02 SN15836N		3 0010	0010	3	IND		2	40			1
A1460	D	Z6	IC Gate	01295	3130-5001-01 SN15862N		1 0010	0010	1	IND		2	40			1
A1470	D	Z2, 3, 7	IC Gate	01295	3130-5001-00 SN15846N		3 0010	0010	3	IND		2	40			1
A1480	D		Plate, Adap. Corn.	14010	2500-5250-00		1 0000	0000	1	IND						
A1490	D		Connector	13511	2101-5003-00 57-40500		1 0000	0020	2	IND						
A1500	D		Socket, IC, 14 Pin	91506	2107-5000-00 314-AG5D-2		8 REF	REF	REF							

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1510	D		Screw Machine	88044	2800-9001-06 AN515-3-R6		2 0000	0000	6	IND			10				1
A1520	D		Nut, Hex., 3-48	80205	2801-0000-03 NAS671-3		2 0000	0000	2	IND			10				1
A1530	D		Washer, Flat #3	80205	2802-0030-03 NAS620-3L		2 0000	0000	30	IND			10				1
A1540	D		Washer, Flt. #4X.032	96906	2802-0000-04 AN960-4		6 0000	0000	6	IND			10				1
A1550	D		Washer, Lock #3	88044	2802-9022-00 AN935-3L		2 0000	0000	6	IND			10				1
A1560	C	J6	Conn. BCD Out.	13511	2101-5003-00 57-40500		1 REF	REF	REF								
A1570	C	J5	Conn. Control	13511	2100-5000-01 MS3102A-18-1P		1 0000	0000	1	48		3	75				1
A1580	C	J20	Conn. P.C. Rem. Prog	14010	2103-5037-01		1 0000	0000	1	48		3	27				1
A1590	D		Conn. P.C.	05574	2103-5037-00 3VH28/1JN5		1 0000	0000	1	48		3	27				1
A1600	C	J8	Conn. AC	82389	2101-5030-01 AC-3G		1 0000	0000	1	IND		1	02				1

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1610	C	J11	Conn., P.C.	Amp. 14010	2103-5001-02		1 0000	0000	1	48		3	27				1
A1620	D		Connector	05574	2103-5001-00 2VK6D/1-2		1 0000	0000	2	48		3	27				1
A1630	C	J12	Conn., Logic Rear	14010	2103-5000-03		1 0000	0000	1	48		3	63				1
A1640	D		Connector	05574	2130-5000-00 2VK18D/1-2		1 0000	0000	1	48		3	63				1
A1650	C	J13	Conn., Logic Frnt.	14010	2103-5003-02		1 0000	0000	1	48		4	20				1
A1660	D		Connector	05574	2103-5003-00 2VK22D/1-2		1 0000	0000	2	48		4	20				1
A1670	C	J10	Conn., Totalizer	14010	I 2103-5003-01		1 0000	0000	1	48		4	20				1
A1680	D		Connector	05574	2103-5003-00 2VK22D/1-2		1 REF	REF	REF								
A1690	C	J9	Conn., Pwr. Sply.	14010	2103-5001-01		1 0000	0000	1	48		3	27				1
A1700	D		Connector	05574	2103-5001-00 2VK6D/1-2		1 REF	REF	REF								

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	PRIME CONTRACTORS LONG PART NO. CODE 5	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	MANUFACTURES LONG PART NO. CODE 17	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1710	C	J1-4	Conn., BNC	13511	2102-5000-00 UG-1094/N		4 0000	0000	4	48		1	38				1
A1720	C	XF1	Fuseholder	75915	2104-3420-04 342004		1 0000	0000	1	IND		1	56				1
A1730	C		Lug, Solder	88557	2108-5001-00 AK-30		1 0000	0000	1	IND			15				1
A1740	C		Lug, Solder	71002	2108-5002-00 #4		4 0000	0000	4	IND			12				1
A1750	C		Washer, Fit. Nyl.	86928	2802-9010-24 5606-28-32		4 0000	0000	4	IND			12				1
A1760	C	C104, 105, 110	Cap., DIsc.		1502-5203-41 MBP203Z5U500M(KLAC)		3 0000	0000	3	IND			40				1 Dilectron Monrovia, Ca.
A1770	C	C103	Cap., Mylar	27556	1506-5254-21 XA2C254		1 REF	REF	REF								
A1780	C	C102	Cap., Elect.	99392	1502-5000-00 21C10AA622		1 0000	0000	1	36		3	94				1
A1790	C	TB1	Strip, Term.	71785	2108-5045-41 2007		1 0000	0000	1	IND			50				1
A1800	C	TB2	Strip, Term.	71785	2108-5045-07 55A		1 0000	0000	1	IND			20				1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	PRIME CONTRACTORS LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	MANUFACTURES LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1810	C	TB3	Strip, Term.	71785	2108-5045-03 52A		1 0000	 0000	1	IND			15				1 REF
A1820	C		Knob, Blk.	21604	2400-5001-05 PS-50D-2 Short		2 0000	 0000	2	IND		2	50				1
A1830	C		Knob, Blk.	21604	2400-5001-00 PS-50D-2		1 000	 0000	1	IND		2	02				1
A1840	C		Knob, Blk.	21604	2400-5001-01 PS-50L-1 Short		1 0000	 0000	1	IND		1	50				1
A1850	C		Knob, Blk.	21604	2400-5000-02 PS-70CL-2		1 0000	 0000	1	IND		2	31				1
A1860	C		Label	14010	2500-3056-00		1 0000	 0000	1	36			36				1
A1870	C		Brkt., Comp. Hold	14010	2500-5159-03		1 0000	 0000	1	IND		3	75				1
A1880	C		Filter	14010	3800-5001-12		1 0000	 0000	1	IND		2	67				1
A1890	C	R107	Res. Carb. Comp.	01121	4700-0472-12 CB4721		1 REF	 REF	REF								
A1900	C	R105,S5	Pot/SW. Assy.	14010	4751-5000-00		1 0000	 0000	1	IND		2	32				1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A1910	C		Foot, Rear	14010	1409-5004-03		2 0000	0000	2	IND				50			1
A1920	C		Foot, L.H.	14010	1409-5004-02		1 0000	0000	1	IND			2	35			1
A1930	C		Foot, R.H.	14010	1409-5004-01		1 0000	0000	1	IND			2	35			1
A1940	C		Bail, 5.5" Ctrs.	14010	1409-5004-00		1 0000	0000	1	IND			5	50			1
A1950	C		Guide P.C.	14010	1400-5005-24		2 0000	0000	2	IND			1	35			1
A1960	D			Guide P.C. 23880	1400-5005-00 1250V		2 0000	0000	2	IND			1	30			1
A1970	C	S17	Switch, Slide	82389	5109-5100-00 46256LF		1 0000	0000	1	IND				51			1
A1980	C	S2, S4	Switch, Pushbutton	82389	5109-5003-00 963		2 0010	0010	2	36			1	65			1
A1990	C	S3, 7, 8, 10	Switch, SPDT	95146	5109-5012-00 MST105D		4 0000	0000	4	48			3	18			1
A2000	C	S1	Switch, Function	81073	5109-5056-26 5002-6		1 0000	0020	1	48			15	00			1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2010	C	S9	Switch, Mult.	81073	5109-5056-04 5001-4		1 0000	 0020	1	48		8	50				1 REF
A2020	C	S11	Thumbsw. Assy.	14010	5103-5004-02		1 0000	 0000	1	48		166	00				1
A2030	D		Brkt., Mtg. R.H.	07126	5109-5044-02 8-06002		1 0000	 0000	1	IND		2	50				1
A2040	D		Brkt., Mtg. L.H.	07126	5109-5044-01 8-06001		1 0000	 000	1	IND		2	50				1
A2050	D		Stud	07126	2809-5001-06 2-45002-6		2 0000	 0000	2	IND			50				1
A2060	D		Nut, Hex, 2-56	07126	2801-0000-22 DHN-13		4 0000	 0000	4	IND			20				1
A2070	D		Switch, 0-9	07126	5109-5035-00 8114		5 0000	 0000	5	48		30	00				1
A2080	D		Switch, 0-9, Dec. Pt.	07126	5109-5035-01 8114 w/W. Dot		1 0000	 0000	1	48		35	00				1
A2090	C	S6, R106	Switch Pot Assy.	14010	5101-5000-01		1 0000	 0000	1	IND		19	56				1
A2100	D		Switch Pot Assy.	14010	5101-5000-00		1 0000	 0000	1	IND		5	73				1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2110	D	R101	Res. Carb.	Comp. 01121	4700-0105-12 CB1051		1 0000	0000	1	60			06				1
A2120	D	R102	Res. Carb.	Comp. 01121	4700-0104-12 CB1041		1 REF	REF	REF								
A2130	D	R103	Res. Carb.	Comp. 01121	4700-0103-12 CB1031		1 REF	REF	REF								
A2140	D	R104	Res. Carb.	Comp. 01121	4700-0124-12 CB1241		1 0000	0000	1	60			06				1
A2150	D	C106	Cap., Mylar	1 27556	506-5254-21 XA2C254		1 REF	REF	REF								
A2160	D	C107	Cap., Disc.		1500-4270-52 TC270N750102K(KLAC)		1 REF	REF	REF								Dilectron Monrovia, Ca.
A2170	D	C108	Cap., Disc.		1500-4151-51 SS151X5S102K(KLAC)		1 0000	0000	1	IND			40				"
A2180	D	C109	Cap. , Disc.		1500-4182-41 SS182YSS500K(KLAC)		1 REF	REF	REF								"
A2190	C		Washer, Keyed	81073	2802-9001-00 12C1087		2 0000	0000	2	IND			25				1
A2200	C	F1	Fuse, 1/4 ASB	75915	5102-3132-50 313.250		1 0020	0020	1	IND		1	00				1
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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2210	C		Spacer, 1/4 OD.	80205	X.281 2803-0003-18 NAS43DD1-18		4 0000	 0000	4	IND			05				1
A2220	C	T3	Transformer	80223	5609-5007-00 0-4		1 0000	 0010	1	IND		24	72				1
A2230	C	T1	Transformer	14010	5602-5000-04		1 0000	 0010	1	IND		52	50				1
A2240	C	T2	Transformer	14010	5602-5017-00		1 0000	 0010	1	IND		18	00				1
A2250	C		Washer, Ins.	14010	3100-5004-00		1 0000	 0000	1	IND			20				1
A2260	C		Cable, A. C. Power	70903	6000-5000-00 17258-S		1 0010	 0000	1	48		2	35				1
A2270	C		Insulator	14010	3100-5001-00		1 0000	 0000	1	IND			48				1
A2280	C	Q105	Transistor, NPN	86684	4803-5001-00 40250		1 0000	 9010	1	60		2	46				1
A2290	C		Corn. El. R.H. F-nt.	14010	3150-5002-22		1 0000	 0000	1	IND		5	00				1
A2300	C		Corn. El. L. H. F-nt.	14010	3150-5002-25		1 0000	 0000	1	IND		5	00				1

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ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2310	C		Corn. El., R. H., Rear	14010	3150-5002-32		1 0000	0000	1	IND		5	00				1
A2320	C		Corn. El., L. H. Rear	14010	3150-5002-35		1 0000	0000	1	IND		5	00				1
A2330	C		Standoff, 4-40 X 1-9/16	14010	2803-0010-01		2 0000	0000	2	IND		1	50				1
A2340	C		Lug, Solder #6	B3330	2108-5033-26 1412-6		1 0000	0000	1	IND			25				1
A2350	C		Washer, Blk. Fibre #6	72653	2802-9026-00 6513-C		4 0000	0000	4	IND			10				1
A2360	C		Clip, 1-1/8 Dia.	86928	2805-5004-00 4521-112-100-2C		1 0000	0000	1	IND			72				1
A2370	C		Screw, Machine	88044	2800-0002-12 MS35206-212		6 0000	0000	6	IND			10				1
A2380	C		Screw, Machine	88044	2800-0002-13 MS35206-213		5 0000	0000	5	IND			10				1
A2390	C		Screw, Machine	88044	2800-0002-14 MS35206-214		4 0000	0000	4	IND			10				1
A2400	C		Screw, Machine	88044	2800-0002-18 MS35206-218		10 0000	0000	10	IND			10				1

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2410	C		Screw, Machine	88044	2800-0002-16 MS35206-216		4 REF	REF	REF								
A2420	C		Screw, Machine	88044	2800-0002-28 MS35206-228		12 0000	0000	12				10				1
A2430	C		Screw, Machine	88044	2800-0002-27 MS35206-227		12 0000	0000	12	IND			10				1
A2440	C		Screw, Machine	88044	2800-0002-29 MS35206-229		1 0000	0000	1	IND			10				1
A2450	C		Screw,	88044	2800-0020-28 MS35214-28		4 0000	0000	4	IND			15				1
A2460	C		Washer, 1/4 X 3/8 X .010	86928	2802-9025-01 5710-63		2 0000	0000	2	IND			15				1
A2470	C		Washer, Flat #4	80205	2802-0030-04 NAS620-4L		44 REF	REF	REF								
A2480	C		Washer, Flat #6	80205	2802-0030-06 NAS620-6L		27 0000	0000	27	IND			10				1
A2490	C		Washer, Lock #4	88044	2802-0210-40 MS35338-40		35 REF	REF	REF								
A2500	C		Washer, Int.	Th. #4 88044	2802-0220-36 MS35333-36		2 0000	0000	2	IND			10				1

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2510	C		Washer, Lock #6	88044	2802-0210-41 MS35338-41		29 0000	0000	29	IND			10				1
A2520	C		Washer, Ins. BNC	2H088	2802-9021-00 10022-N		4 0000	0000	4	IND			25				1
A2530	C		Washer, Flat #2	80205	2802-0020-02 NAS620-2		6 0000	0000	6	IND			10				1
A2540	C		Nut, Speed, U#4	78553	2801-9011-00 C11374-440-4		2 0000	0000	2	IND			10				1
A2550	C		Nut, Hex, 4-40	80205	2801-0000-04 NAS671-4		26 REF	REF	REF								
A2560	C		Nut, Hex, 6-32	80205	2801-0000-06 NAS671-6		3 0000	0000	3	IND			10				1
A2570	C		Washer, Lock #2	88044	2802-0210-39 MS35338-39		6 0000	0000	6	IND			10				1
A2580	C		Nut, Hex, 2-56	80205	2801-0000-02 NAS671-2		4 0000	0000	4	IND			10				1
A2590	C		Cap., Elect.	14655	1502-0257-06 8R250-50		1 0000	0010	1	36		3	20				1
A2600	C		Diode, Silicon	81349	4801-5005-00 1N4148		1 REF	REF	REF								

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SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2610	C	CR1-4	Diode, Silicon	14010	4801-2542-00		4 0010	0020	4	IND		1	15				1
A2620	C	R108	Res. Wire Wnd.	63743	4701-0351-32 3X350		1 0000	0000	1	IND		1	50				
A2630	C	R109	Res. Carb. Comp.	01121	4700-0333-12 CB3331		1 REF	REF	REF								
A2640	C	R110	Res. Carb. Comp,	01121	4700-0332-12 CB3321		1 REF	REF	REF								
A2650	C	L1, 2	Inductor, 120 mh	99800	1809-5000-00 2890-44		2 0000	0000	2	IND		2	40				1
A2660	C	AR1	R. F. Am,.	18316	C50653		1 0000	0000	1	IND		250	00				6
A2661	D		Enclosure-Ampl-Demod.	18316	C31206		1 0000	1 0000	1	IND		25	00				6
A2662	D		Cover-Ampl-Demod.	18316	1 C11715		0000	1 0000	1	IND		10	00				6
A2663	D		Assy, PCB, Ampl-Demod.	18316	01-12261 D01		1 0000	1 0000	1	IND		110	00				6
A2664	D		Assy, PCB, Power Regulator	18316	01-12264 D01		1 0000	1 0000	1	IND		100	00				6

CONTRACT NUMBER DAAH01-71-C-1250 | NOMENCLATURE FLOW INDICATOR | MODEL/TYPE NO. CF-604-6-8175Q

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SYMBOL NO. PREFIX
OR UNIT
NOMENCLATURE

COMPONENT PARTS AND PROVISIONING LIST

ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2665	D		Connector (MS3102A-10SL-3P	02660	28-12069-N02		1 0000	1 0000	1	IND		5	00				2
A2670	C		Screw, Machine	88044	2800-9001-06 AN515-3-R6		4 REF	REF	REF								
A2680	C		Screw, Machine	88044	2800-0002-02 MS35206-202		2 0000	0000	2	IND			10				1
A2690	C		Screw, Machine	88044	2800-0200-03 MS24693-S2		2 0000	0000	2	IND			10				1
A2700	C		Screw, Machine	88044	2800-0200-06 MS24693-S3		5 0000	0000	5	IND			10				1

CONTRACT NUMBER	NOMENCLATURE	MODEL/TYPE NO.
DAAH01-71-C-1250	FLOW INDICATOR	CF-604-6-8175Q

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SYMBOL NO. PREFIX
OR UNIT
NOMENCLATURE

COMPONENT PARTS AND PROVISIONING LIST

ITEM OR SEQUENCE NO. 1	IND. 2	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHERS 3	ITEM NAME 4		PRIME CONTRACTORS PART NUMBER 5	LONG PART NO. CODE	QTY PER ASSY 6	QTY PER COMP 7	QTY END ARTICLE 8	SHELF LIFE 9	TOTAL QTY RECM/ ORDERED 10	UNIT DOLLARS 11	CENTS	EST.	EXTENDED UNIT PRICE DOLLARS 12	CENTS	REMARKS
SMR CODE 13		STOCK NUMBER 14	ITEM AND LOT NO. 15	FEDERAL MFR. CODE 16	MANUFACTURES PART NUMBER 17	LONG PART NO. CODE	RECM MAINT QTY/ FACTOR 18	RECM OVHL QTY/ FACTOR 19	USABLE ON CODE 20	OPTIONAL 21		SPARES ALLOCATIONS 22					LT 23
A2710	C		Screw,	Machine 88044	2800-0200-06 MS24693-S6		6 0000	0000	6	IND		10					1
A2720	C		Screw,	Machine 88044	2800-0200-48 MS24693-S48		2 0000	0000	2	IND		10					1
A2730	C		Washer,	Lock #3 88044	2802-9022-00 AN935-3L		4 REF	REF	REF								
A2740	C		Washer,	Lock #8 88044	2802-0210-42 MS35338-42		2 0000	0000	2	IND		10					1
A2750	C		Washer,	Flat #8 80205	2802-0030-08 NAS620-8L		2 0000	0000	2	IND		10					1
A2760	C		Washer,	Flat #3 80205	2802-0030-03 NAS620-3L		28 REF	REF	REF								
A2770	C		Nut,	Hex, 8-32 80205	2801-0000-08 NAS671-8		2 0000	0000	2	IND			10				1
A2780	C		Shield,	Mag. 14010	2509-5097-00		1 0000	0000	1	IND		2	50				1

CONTRACT NUMBER	NOMENCLATURE	MODEL/TYPE NO.
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Section VII
REPAIR PARTS LIST

7.1 Introduction

This section lists repair parts that are required for maintenance of Flow Transfer Kit, Flow Technology Model FT-AFS4-CF and is applicable to Army Area Calibration Terms (AACT's).

NOTE

Throughout this section, DS is used to indicate AACT.

7.2 General

This section is divided as follows:

(1) Repair Parts List. A list, in alphabetical sequence, of repair parts authorized for the performance of maintenance at the AACT.

(2) National Stock Number and Reference Number Index. A list, in ascending numerical sequence, of all National stock numbers (NSN's) appearing in the repair parts list, followed by a list of all reference numbers in alpha-numeric sequence appearing in the list. The NSN's and reference numbers are cross-referenced to a figure number and item number in column 1.

NOTE

The figure and item number columns represent cross-reference numbers, since illustrations are not included in this section.

Refer to section I of TM 94931-700-34P for explanation of columns (para 3), special information (para 4, except for subparagraph 40 which is not applicable to this section), and abbreviations (para 6).

7.3 How to Locate Repair Parts

When NSN or reference number is unknown, use the repair parts listing and locate the item by description.

When National stock number or reference number is known, use the list of NSN's or the reference numbers and locate the cross-referenced figure and item numbers. Locate the cross-referenced figure and item number under column 1 of the repair parts list for the complete description of the repair part.

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION *USABLE ON CODE*	(7) U/M	(8) QTY INC IN UNIT
						GROUP 6486 FLOW INDICATOR C50652 14010 MAINFRAME ASSEMBLY CONSISTING OF		
1	3	PAFZZ	5910-07-211-2487	1502-5000-00	1401D	CAPACITOR,FIXED, ELECTROLYTIC 21C10AA622 FSCM 99392	EA	1
1	5	PAFZZ	5340-00-163-6885	4521-112-10C-2C	86928	CLIP 2805-5004-00 FSCM 14010	EA	1
1	7	PAFZZ	5935-00-062-1776	10187815	18876	CONNECTOR,RECEPTACLF,ELECTRICAL PN 57-40500 FSCM 1351	EA	1
1	9	PAFZZ	5935-00-180-1249	2V1801D1-2	05574	CONNECTOR,RECEPTACLE,ELECTRICAL 2130-5000-00 FSCM 14010	EA	1
1	11	PAFZZ	5935-00-436-2657	2VK2201-2	05574	CONNECTOR,RECFPTACLE.ELECTRICAL 2103-5003-00 FSCM 1410	EA	1
1	13	PAFZZ	5935-00-434-7828	2VK6D01-2	05574	CONNECTOR,RECEPTACLE,ELECTRICAL 2103-5001-00 FSCM 14010	EA	1
1	15	PAFZZ	5935-07-058-9423	308087	07980	CONNECTOR,RECEPTACLE,ELECTRICAL 2101-5030-1 FSCM 14010	EA	1
1	17	PAFZZ	5920-00-504-8634	313-25	75915	FUSE.CARTRIDGE 5102-3132-50 FSCM 14010	EA	1
1	21	PAFZZ	5355-00-759-1936	PSSLD2	21604	KNOB 2400 -5001-05 FSCM 14010	EA	2
1	23	PAFZZ	5310-30-225-3042	DHN13	07126	NUT 2801-OC00-22 FSCM 14010	EA	4
1	25	PAFZZ	5310-00-817-9056	NAS671-2	80205	NUT,PLAIN.HEXAGON 2801-OC0o-02 FSCM 14010	EA	4
1	27	PAFZZ	5310-07-722-5428	NA5671-3	86205	NUT,PIAIN,HEXAGON 2801-00o-C-3 FSCM 14010	EA	2
1	29	PAFZZ	5310-00-810-7785	NAS671-4	83205	NUT.PLAIN.HEXAGON 2801-0000-04 FSCM 14010	EA	26
1	31	PAFZZ	5312-00-631-1294	NA5671-6	86205	NUT,PLAIN,HEXAGON 2801-0000-06 FSCM 14010	EA	3
1	33	PAFZZ	5310-00-725-4712	NA5671-8	80205	NUT,PLAIN,HEXAGON 2801-0000-08 FSCM 14010	EA	1
1	35	PAFZZ	5310-00-006-8373	C11374-440-4	78553	NUT,SHFET SPRING 2801-9011-00 FSCM 14010	EA	1
1	37	PAFZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR ,FIXED COMPOSITION 4700-0103-12 FSCM 14010	EA	1
1	39	PAFZZ	5905-00-110-0398	RCR07GL04JS	81349	PESISTOR,FIXED COMPOSITION 4700-0104-12 FSCM 14010	EA	1
1	41	PAFZZ	5905-00-116-8554	RCR07G105JS	81349	RESISTOR,FIXED,COMPOSITION 4700-0105-12 FSCM 14010	EA	1
1	43	PAFZZ	59s5-00-400-4528	SCR07G124JS	81349	RESISTOR,FIXED COMPOSITION 47D-0124-12 FSCM 14010	EA	1
1	45	PAFZZ	5905-00-126-6683	RCR07G332JS	81349	RESISTOR,FIXFD COMPOSITION 4700-0332-12 FSCM 14010	EA	1
1	47	PAFZZ	5905-00-118-4559	RCR0TG333JS	81349	RESISTOR,FIXED COMPOSITION 4700-0333-12 FSCM 14010	EA	1
1	49	PAFZZ	5905-00-114-0711	RCRT7G472JS	81349	RESISTOR,FIXED COMPOSITION 4700-0472-12 FSCM 14010	EA	1
1	51	PAFZZ	5305-00-151-3164	AN515-3R6	88044	SCREW,MACHINE 2800-9001-06 FSCM 14010	EA	10
1	53	PAFZZ	5305-00-081-6668	M524693S2	969T6	SCREW,MACHINE 2R90-0200-03 FSCM 14010	EA	2
1	55	PAFZZ	5305-00-957-2383	M524693S3	96906	SCREW,MACHINE 280C-0200-06 FSCM 16410	EA	5
1	57	PAFZZ	5305-00-808-7834	MS24693S6	96906	SCREW.MACHINE 2800-0200-06 FSCM 14010	EA	6
1	59	PAFZZ	5305-00-957-7814	M524693S48	96906	SCREW.MACHINE 28U0-0200-48 FSCM 14010	EA	2
1	61	PAFZZ	5305-00-762-7482	MS35206-202	96906	SCREW,MACHINE 280C-0002-02 FSCM 14010	EA	2
1	63	PAFZZ	5305-00-993-0191	M535206-212	96906	SCREW,MACHINE 2800-0002-12 FSCM 14010	EA	6
1	65	PAFZZ	5305-00-889-3116	MS35206-213	96906	SCRFW.MACHINE 2800-3D02-13 FSCM 14010	EA	5
1	67	PAFZZ	5305-00-993-0190	MS35206-214	96906	SCRFW,MACHINE 2800-0002-14 F5CM 14010	EA	4
1	69	PAFZZ	5305-00-889-2998	M535206-216	96906	SCREW,MACHINE 2800-0002-16 FSCM 14010	EA	4

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION *USABLE ON CODE*	(7) U/M	(8) QTY INC IN UNIT
1	71	PAFZZ	5305-00-983-6730	MS35206-218	96906	SCREW,MACHINE 2800-0002-18 FSCM 14010	EA	10
1	73	PAFZZ	5305-00-984-4984	MS35206-227	969s6	SCREW, MACHINE 2800-0002-27 FSCM 14010	EA	12
1	75	PAFZZ	5305-00-984-4988	MS35206-228	96906	SCREW,MACHINE 2800-0002-28 FSCM 14010	EA	12
1	77	PAFZZ	5305-03-984-4981	MS35206-229	969A6	SCREW,MACHINE 280D-0002-29 FSCM 14010	EA	1
1	79	PAFZZ	5305-00-638-0502	M535214-28	96906	SCREW,MACHINE 2800-0020-28 FSCM 14010	EA	4
1	81	PAFZZ	5961-00-003-5816	4801-2542-00	14010	SEMICONDUCTOR DEVICE,DIODE	EA	4
1	83	PAFZZ	5365-00-937-0629	5710-63	86928	SHIM 2832-9b25-01 FSCM 14010	EA	2
1	85	PAFZZ	5935-00-103-7987	314AG5D2R	91506	SOCKET,PLUG-IN ELECTRONIC COMPONENTS PN 2107-5000-00 FSCM 18316	EA	1
1	87	PAFZZ	5930-00-003-5815	4751-500-00	14010	SWITCH,ELECTRICAL	EA	1t
1	89	PAFZZ	5930-00-834-9742	963	82389	SWITCH,PUSH 5109-5003-00 FSCM 14010	EA	2
1	91	PAFZZ	5930-00-410-5463	5001-4	81073	SWITCH.ROTARY 5109-5C56-04 FSCM 14010	EA	1
1	93	PAFZZ	5930-00-003-4743	5101-5000-00	14010	SWITCH,ROTARY	EA	
1	95	PAFZZ	6625-00-005-1284	5101-5000-01	14010	SWITCH,ROTARY,WIRE	EA	1
1	97	PAFZZ	5930-00-655-3754	5002-6	81073	SWITCH,ROTARY 5109-5056-26 FSCM 14010	EA	1
1	99	PAFZZ	5930-00-059-1390	46256LF	82389	SWITCH,SLIDE 5109-5100-00 FSCM 14010	EA	1
1	101	PAFZZ	5930-00-902-4150	MST105D	95146	SWITCH,TOGGLE 5109-5012-00 FSCM 14010	EA	4
1	103	PAFZZ	5940-00-192-9962	332-14-08-042	71785	TERMINAL BOARD 2108-5045-03 FSCM 14010	EA	1
1	105	PAFZZ	5940-00-192-6653	2007	71785	TERMINAL BOARD 2108-5045-41 FSCM 14010	EA	1
1	107	PAFZZ	5940-00-882-9091	1412-6	83330	TERMINAL,LUG 2108-5033-26 FSCM 14010	EA	1
1	109	PAFZZ	595?-'P-731-1854	0-4	8?223	TRANSFORMER,AUDIO FREQUENCY 5609-5007-00 FSCM 14010	EA	1
1	111	PAFZZ	5950-00-320-7526	5602-5000-04	14010	TRANSFORMER,POWER.STEP-DOWN AND STEP-UP	EA	1
1	113	PAFZZ	5961-00-905-2926	40250	86684	TRANSISTOR 4803-5001-00 FSCM 14010	EA	1
1	115	PAFZZ	5310-00-261-7437	AN935-3L	8RC44	WASHER,LOCK 2802-9022-00 FSCM 14010	EA	10
1	117	PAFZZ	5310-00-950-1310	9190604	18876	WASHER.FLAT 2802-000-04 FSCM 14010	EA	6
1	119	PAFZZ	5310-00-193-7577	MS35333-36	969P6	WASHEP,LOCK 2802-0220-36 FSCM 14010	EA	2
1	121	PAFZZ	5310-00-543-5060	MS35338-39	96906	WASHFR,LOCK 2802-0210-39 FSCM 14010	EA	6
1	123	PAFZZ	5310-00-045-4007	MS35338-41	96906	WASHER,LOCK 2802-0210-41 FSCM 14010	EA	29
1	125	PAFZZ	5310-00-045-3299	M535338-42	96906	WASHER,LOCK 2812-1210-42 FSCM 14010	EA	2
1	127	PAFZZ	5310-00-616-6791	NAS620-2	8?205	WASHER,FLAT 2802-0020-02 FSCM 14010	EA	6
1	129	PAFZZ	5310-00-576-0900	NAS620-3L	80205	WASHER.FLAT 2802-0030-03 FSCM 14010	EA	58
1	131	PAFZZ	5310-00-616-3648	NAS62f-4L	83235	WASHER,FLAT 28r2-053-014 FSCM 14010	EA	44
1	133	PAFZZ	5310-00-616-6822	NAS620-6L	80205	WASHER,FLAT 2802-0030-06 FSCM 14010	EA	27
1	134	PAFZZ	5310-00-261-7431	AN935-3L	88044	WASHER,LOCK SPLIT,S,CD-PLTD FIN.,0.111 ID,0.188 OD.0.026 THK	EA	4
1	135	PAFZZ	5310-00-834-7420	NAS620-8L	8D205	WASHER,FLAT 2802-0030-08 FSCM 14010	EA	2
1	137	PAFZZ	5310-00-543-2410	21PX16	75477	WASHER,LOCK M535338-40 FSCM 96906	EA	35
1	139	PAFZZ	531C-00-724-4310	5606-28-32	86928	WASHER,FLAT	EA	4
1	141	PAFZZ	5311-00-298-3881	6513	72653	WASHER.FLAT 2802-9026-00 FSCM 14010	EA	4
2	3	PDFFD	4931-01-008-3429	1700-5139-04	14010	CIRCUIT CARD ASSEMBLY	EA	1

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION *USABLE ON CODE*	(7) U/M	(8) QTY INC IN UNIT
						CONSISTING OF		
2	5	PAFZZ	5910-00-003-2300	TNT205UO50P1A	90201	CAPACITOR,FIXED ELECTROLYTIC 1503-6205-50 FSCM 14010	EA	1
2	7	PAFZZ	5910-00-864-8335	TE1129	56289	CAPACITOR,FIXED ELECTRICAL 1502-5156-03 FSCM 14010	EA	1
2	9	PAFZZ	5910-00-689-9648	DM15F102G100WVDC	84171	CAPACITOR,FIXED,MICA DIELECTRIC 1505-3102-12 FSCM 14010	EA	1
2	11	PAFZZ	5962-00-372-0476	M38510-00108BCB	81349	41CROCIRCUIT.DIGITAL 31310-5000-C5 FSCM 14010	EA	1
2	13	PAFZZ	5962-00-865-4625	SN7400N	01295	MICROCIRCUIT,OIGITAL 3130-5000-00 FSCM 14010	EA	8
2	15	PAFZZ	5962-00-163-9181	SN7401N	01295	MICROCIRCUIT,DIGITAL 3130-5000-01 FSCM 14010	EA	9
2	17	PAFZZ	5962-00-369-7607	M38510-00401BCB	81349	MICROCIRCUIT,OIGITAL 3131-5000-02 FSCM 14010	EA	6
2	19	PAFZZ	5962-00-865-4626	2605355-2	06424	MICROCIRCUIT,DIGITAL SN7410N FSCM 01295	EA	2
2	21	PAFZZ	5962-00-865-4631	SN7472N	01295	MICROCIRCUIT.DIGITAL 3130-5000-72 FSCM 14010	EA	1
2	23	PAFZZ	5962-00-369-7621	M38510-00202BCB	81349	MICROCIRCUIT,DICITAL 3130-5000-73 FSCM 14010	EA	1
2	25	PAFZZ	5962-00-162-7505	SNC5490AJ	01295	4ICROCIRCUIT,DIGITAL 3130-5000-90 FSCN 14010	EA	10
2	27	PAFZZ	5310-00-810-7785	NAS671-4	80205	NUT,PLAIN,HEXAGON 2801-0000-04 FSCM 14010	EA	28
2	29	PAFZZ	5905-'0-141-1183	RCR07G101JS	81349	RESISTOR,FIXED,COMPOSITION 4700-0101-12 FSCM 14010	EA	10
2	31	PAFZZ	5905-00-107-0656	RCR07G100JS	81349	RFSISTOR,FIXED COMPOSITION 4700-0100-12 FSCM 14010	EA	2
2	33	PAFZZ	5905-00-135-3973	RCR07G221JS	81349	RESISTOR,FIXED COMPOSITICN 4700-0221-12 FSCM 14010	EA	1
2	35	PAFZZ	5905-00-407-2154	CB2711	01121	RESISTOR,FIXED COMPOSITION 4700-0271-12 FSCM 14010	EA	3
2	37	PAFZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR,FIXEO COMPOSITION 4700-0471-12 FSCM 14010	EA	17
2	39	PAFZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR,FIXED COMPOSITION C81021 FSCM 01121	EA	10
2	41	PAFZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR,FIXED COMPOSITION 4700-0222-12 FSCM 14010	EA	1
2	43	PAFZZ	5905-00-114-071	RCR07G472JS	81349	RESISTOR,FIXED COMPOSITION C84721 FSCM 01121	EA	1
2	45	PAFZZ	5905-00-115-8055	RCRD7G393JS	81349	RESISTOR,FIXED COMPOSITION 4700-0393-12 FSCM 14010	EA	1
2	47	PAFZZ	5905-00-141-0717	RCRD7G473JS	81349	RESISTOR,FIXED COMPOSITION 4700-0473-12 FSCM 14010	EA	4
2	45	PAFZZ	5905-00-116-8555	RCRD7G153JS	81349	RESISTOR,FIXED COMPOSITION 4700-0153-12 FSCM 14010	EA	2
2	51	PAFZZ	5905-00-126-6694	RCRD7G4TSJS	81349	RESISTOR,FIXEDOCOMPOSITION 4700-0475-12 FSCM 14010	EA	1
2	53	PAFZZ	5905-00-106-3666	RCRD7G103JS	81349	RESISTOR,FIXED COMPOSITION 4700-0103-12 FSCM 14010	EA	1
2	55	PAFZZ	5305-00-889-2998	203-21207-186	94990	SCREW,MACHINE MS535206-216 FSCM 96906	EA	6
2	57	PAFZZ	5961-00-793-4071	1N270	81349	SEMICONOUCTOR DEVICE.DIODE 4800-5000-00 FSCM 14010	EA	29
2	59	PAFZZ	5961-00-763-7891	MPS2369	34713	TRANSISTOR 4803-5000-00 FSCM 14010	EA	4
2	61	PAFZZ	5961-00-452-1496	2N4410	81349	TRANSISTOR,SPECIAL 4803-5004-00 FSCM 14010	EA	1
2	63	PAFZZ	5310-00-543241C	21PX16	75477	WASHER,LOCK 2802-0210-40 FSCM 14010	EA	37
3	3	PDFFD	4931-01-012-2924	1704-5033-99	14013	CIRCUIT CARD ASSEMBLY CONSISTING OF	EA	1
3	5	PAFZZ	5910-00-864-8335	TE1129	80183	CAPACITOR,FIXED ELECTRICAL 1502-5156-03 FSCM 14010	EA	4
3	7	PAFZZ	5962-00-162-7505	SNC5490AJ	01295	MICPOCIRCUIT.DIGITAL 3130-5000-90 FSCM 14010	EA	16

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION *USABLE ON CODE*	(7) U/M	(8) QTY INC IN UNIT
3	9	PAFZZ	5962-00-922-3219	SN7441N	01295	MICROCIRCUIT,DIGITAL 3130-5000-41 FSCM 14010	EA	6
3	11	PAFZZ	59627-175-8943	SN7475N	01295	MICROCIRCUIT,DIGITAL 3130-5003-75 FSCM 14010	EA	7
3	13	PAFZZ	5905-30-107-0656	RCR07G100JS	81349	RESISTOR,FIXED COMPOSITION 4700-0100-12 FSCM 14010	EA	27
3	15	PAFZZ	5905-00-114-5343	RCR07G182JS	81349	RESISTTR,FIXED COMPOSITION 4700-0182-12 FSCM 14010	EA	25
3	17	PAFZZ	5935-00-141-0743	RCR07G392JS	81349	RFSISTOR,FIXED COMPOSITION 4700-0392-32 FSCM 14010	EA	6
3	19	PAFZZ	5905-00-498-6053	C82231	01121	RESISTOR,FIXED COMPOSITION 47000-0223-12 FSCM 14010	EA	5
3	21	PAFZZ	5305-00-103-7987	MS24621-9	96906	SCREW,TAPPING,THREADED 2800-0300-09 FSCM 14010	EA	1
3	23	PAFZZ	5935-00-103-7987	314AG5D2	91596	SOCKET,PLUG-IN FLECTRONIC COMPONENTS 2107-5000-00 FSCM 14010	EA	13
3	25	PAFZZ	5961-00-452-1496	2N4410	81349	TANSISTOR,SPECIAL 4833-5004-00 FSCM 14010	EA	2
4	3	PDFFF	4931-01-008-3427	1700-5140-00	14101	CIRCUIT CARD ASSEM8BLY CONSISTING OF	EA	1
4	5	PAFZZ	5910-00-864-8335	TE1129	56289	CAPACITOR,FIXED ELECTRICAL 1502-5156-03 FSCM 14010	EA	1
4	7	PAFZZ	5962-00-011-2962	M38510/03001BCB	81349	MICROCIRCUIT,DIGITAL 3130-5001-05 FSCM 14010	EA	1
4	9	PAFZZ	5962-00-193-0323	SN15836N	01295	MICROCIRCUIT,DIGITAL 3130-5001-02 FSCM 14010	EA	3
4	11 -	PAFZZ	5962-00-927-1749	SN15862N	11295	MICROCIRCUIT.DIGITAL 313C-5001-01 FSCM 14010	EA	1
4	13	PAFZZ	5962-00-819-2215	SN15846N	01295	MICROCIRCUIT,DIGITAL 3130-5001-00 FSCM 14010	EA	3
4	15	PAFZZ	5905-00-114-0711	RCRC7G472JS	81349	RESISTDR,FIXED COMPOSITION 4700-0472-12 FSCM 14010	EA	1
4	11	PAFZZ	5915-00-106-3666	RCR07G103JS	81349	ESISTOR,FIXED COMPOSITION 4730-0113-12 FSCM 14010	EA	10
4	19 -	PAFZZ	5961-00-793-4371	1N270	81349	SEMICONDUCTOR DEVICE,DIODE 4800-5000-00 FSCM 14010	EA	28
5	3	PAFZZ	4931-00-008-3428	1700-5000-03	14010	CIRCUIT CARD ASSEMBLY CONSISTING OF	EA	1
5	5	PAFZZ	5910-00-096-3419	KLACTCN150A-SPFP DRM10PCT	22701	CAPACITOR,FIXED,CERAMIC DIELECTRIC 1500-6472-41 FSCM 14010	EA	1
5	7	PAFZZ	5-10-00-763-7790	76FG2CK151	01002	CAPACITOR ,FIXED, ELECTROLYTIC 1500-5157-02 FSCM 14010	EA	2
5	q	PAFZZ	5912-00-947-8285	76F02EM221	b6001	CAPACITOR,FIXED ELECTRICAL 1502-5227-03 FSCM 14010	EA	1
5	11	PAFZZ	5905-00-126-6683	RCR07G332JS	81349	RESISTOR,FIXED COMPOSITION 4700-0101-12 FSCM 14010	EA	2
5	13	PAFZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR,FIXED COMPOSITION 47D0-0471-12 FSCM 14010	EA	2
5	15	PAFZZ	5905-30-411-0323	CB1021	01121	RESISTOR,FIXED COMPOSITION 4700-0102-12 FSCM 14010	EA	2
5	17	PAFZZ	5905-00-106-1356	RCR07G152JS	81349	RESISTOR,FIXED COMPOSITION 4700-0152-12 FSCM 14010	EA	1
5	IS	PAFZZ	5975-00-105-7764	RCR07G222JS	81349	RESISTOR,FIXED COMPOSITION CB2221 FSCM 01121	EA	3
5	21	PAFZZ	5905-00-141-0743	RCR07G392JS	81349	RESISTOR,FIXED COMPOSITION 4700-0392-12 FSCM 14010	EA	1
5	23	PAFZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR,FIXED COMPOSITION 47D00-0472-12 FSCM 14010	EA	1
5	25	PAFZZ	5905-00-104-8358	RCR07G822JS	81349	9ESISTOR,FIXED COMPOSITION 4700-0822-12 FSCM 14010	EA	1
5	27	PAFZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR,FIXED COMPOSITION 4700-0103-12 FSCM 14010	EA	1

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION *USABLE ON CODE*	(7) U/M	(8) QTY INC IN UNIT
5	25	PAFZZ	5905-00-498-6053	CB2231	01121	RESISTOR,FIXED COMPOSITION 4700-0223-12 FSCM 14010	EA	2
5	31	PAFZZ	5905-00-118-4559	RCR07G333JS	81349	-RESISTOR.FIXED COMPOSITION 47'0-1333-12 FSCM 14010	EA	1
5	33	PAFZZ	5905-00-119-3505	RCR07G683JS	81349	RESISTOR,FIXED COMPOSITION 4700-0683-12 FSCM 14010	EA	1
5	35	PAFZZ	5935-00-782-4752	2107-4002-01	14010	SOCKET.,PLUG-IN ELECTRONIC COMPONENTS	EA	1
5	37	PAFZZ	5935-00-678-9774	3303	91662	SOCKET,PLUG-IN ELECTRONIC COMPONENTS 05-3303 FSCM 11769	EA	4
5	39	PAFZZ	5961-00-156-0477	TIS75	01295	TRANSISTOR 4807-5000-00 FSCM 14010	EA	1
6	3	PAFZZ	6625-00-890-6417	1700-5037-03	14010	POWER SJPPLY SUBASSEMBLY CONSISTING OF	EA	1
6	5	PAFZZ	5910-00-864-8335	TE1129	80183	CAPACITOR,FIXED ELECTRICAL 1502-515603 FSCN 14010	EA	1
6	7	PAFZZ	5905-00-407-2150	CS8201	01121	RESISTOR,FIXED.CONMPOSITION 4700-0820-12 FSCM 14010	EA	1
6	9	PAFZZ	5905-00-407-2154	CB2711	01121	RESISTOR.FIXED COMPOSITION 4700-0271-12 FSCM 14C10	EA	1
6	11	PAFZZ	5905-04-114-0710	RCR07G331JS	81349	RESISTOR,FIXED COMPOSITION 4700-0331-12 FSCM 14010	EA	1
6	13	PAFZZ	5905-00-411-0323	C81021	01121	RESISTOR,FIXED COMPOSITION 4700-0102-L2 FSCN 14010	EA	1
6	15	PAFZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR,FIXED COMPOSITION 4700-0222-12 FSCM 14010	EA	1
6	17	PAFZZ	5905-00-126-6683	RCR07G332JS	81349	RESISTOR.FIXED COMPOSITION CB3321 FSCM 01121	EA	1
6	19	PAFZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR,FIXED COMPOSITION 4700-0472-12 FSCM 14010	EA	3
6	21	PAFZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR,FIXED COMPOSITION 4700-0103-12 FSCM 14010	EA	1
6	23	PAFZZ	5905-00-110-0388	RCR07G104JS	81349	RESISTOR,FIXED COMPOSITION 470C-010412 FSCM 14010	EA	1
6	25	PAFZZ	5905-00-114-5344	RCR07G184JS	81349	RFSISTOR,FIXED COMPOSITION 4700-0184-12 FSCM 14010	EA	1
6	27	PAPZZ	5905-00-111-4734	RCR20G470JS	81349	RESISTOR,FIXED COMPOSITION 4700-0470-13 FSCN 14010	EA	1
6	29	PAFZZ	5905-00-716-2486	3X5000	63743	RESISTOR,FIXED,WIRE WOUND 4701-0502-32 FSCN 14010	EA	2
6	31	PAFZZ	5961-00-484-5009	1N4816	80131	SEMICONDUCTOR DEVICE,DIOOE 4801-5002-00 FSCM 14010	EA	2
6	33	PAFZZ	5935-00-782-4752	2107-4002-01	14010	SOCKET,PLUG-IN ELECTRONIC COMPONENTS	EA	6
6	35	PAFZZ	5935-00-678-9774	33C3	91662	SOCKET,PLUG-IN ELECTRONIC COMPONENTS 2107-4002-00 FSCM 14010	EA	10
6	37	PAFZZ	5961-00-723-3602	JAN1N3612	81349	SEMICONOUCTOR DEVICEDIOODE 4801-5001-00 FSCM 14010	EA	1
6	39	PAFZZ	5961-00-847-5246	JAN1N746A	81349	SEMICONOUCTOP DEVICE,DIODE 4802-5000-00 FSCM 14010	EA	1
6	41	PAFZZ	5961-00-437-6697	2N3569	80131	TRANSISTOR 4803-4169-00 FSCN 14010	EA	3
6	43	PAFZZ	5961-00-828-0714	MJE340	34713	TRANSISTOR 4803-5002-00 FSCM 14010	EA	1
6	45	PAFZZ	5961-00-103-3981	2N3644	80131	TRANSISTOR 4804-3126-00 FSCM 14010	EA	1

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

NATIONAL STOCK NUMBER INDEX CROSS-REFERENCED TO FIGURE AND ITEM NUMBER

STOCK NUMBER	FIG. NO.	ITEM NO.	STOCK NUMBER	FIG. NO.	ITEM NO.
5910-O0-003-2300	2	5	5905-00-407-2150	6	1
5930-00-003-4743	1	93	5905-O0-407-2154	2	35
5930-00-003-5815	1	87	5905-00-407-2154	6	9
5961-00-003-5816	1	81	5930-00-410-5463	1	91
6625-00-005-1284	1	95	5905-00-411-0323	5	15
5310-00-006-8373	1	35	5905-00-4L1-0323	6	13
5962-00-011-2962	4	7	5935-00-434-7828	1	13
5310-00-045-3299	1	125	5935-00-436-2657	1	11
5310-00-045-4007	1	123	5961-00-437-6697	6	41
5305-00-053-1112	3	21	5961-00-452-1496	2	6L
5935-00-058-9423	1	15	5961-00-452-1496	3	25
5930-00-059-1390	1	99	5961-00-484-5009	6	31
5935-00-062-1776	1	7	5905-00-498-6353	3	19
5305-00-081-6668	1	53	5905-00-498-6053	5	29
5910-00-096-3419	5	5	5920-00-504-8634	1	17
5961-00-103-3981	6	45	5310-00-543-2410	1	137
5935-00-103-7987	1	85	5310-00-543-2410	2	63
5935-00-103-7987	3	23	5310-00-543-5060	1	121
5905-00-104-8358	5	25	5310-00-576-0900	1	129
5905-00-105-7764	2	41	5310-00-616-3648	1	131
5905-00-105-7764	5	19	5310-00-616-6191	1	121
5905-00-105-7764	6	15	5310-00-616-6822	1	133
5905-00-106-1356	5	17	5310-30-631-1294	1	31
5905-00-106-3666	1	37	5305-00-638-0502	1	79
5905-00-106-3666	2	53	5930-00-655-3754	1	97
5905-00-106-3666	4	17	5935-00-678-9774	5	31
5905-00-106-3666	5	27	5935-00-678-9774	6	35
5905-00-106-3666	6	21	5910-00-689-9648	2	9
5905-00-101-0656	2	31	5905-00-716-2486	6	29
5905-00-107-0656	3	13	5310-00-722-5428	1	27
5905-00-110-0388	1	39	5961-00-123-3602	6	37
5905-00-110-0388	6	23	5310-00-724-4310	1	139
5905-00-110-7620	2	39	5310-00-725-7712	1	33
5905-00-111-4734	6	27	5950-00-731-1854	1	109
5905-00-114-0710	6	11	5355-00-759-1936	1	21
5905-00-114-0711	1	49	5305-00-762-7482	1	61
5905-00-114-0111	2	43	5910-00-763-7790	5	7
5905-00-114-0711	4	15	5961-03-763-7891	2	59
5905-00-114-0711	5	23	5935-00-782-4752	5	35
5905-00-114-0711	6	19	5935-00-782-4752	6	33
5905-00-114-5343	3	15	5961-00-793-4071	2	57
5905-00-114-5344	6	25	5961-00-793-4071	4	19
5905-00-115-8055	2	45	5305-00-808-7834	1	57
5905-00-116-8554	1	41	5310-00-810-7T85	1	29
5905-00-116-8555	2	49	5310-00-810-7785	2	27
5905-00-118-4559	1	47	5310-00-810-9056	1	25
5905-00-118-4559	5	31	5962-00-819-2215	4	13
5905-00-119-3505	5	33	5961-00-828-0719	6	43
5905-00-120-9154	2	37	5310-00-834-7420	1	135
5905-00-120-9154	5	13	5930-00-834-9742	1	89
5905-00-126-6683	1	45	5961-00-834-5246	6	39
5905-00-126-6683	5	11	5910-00-864-8335	2	7
5905-00-126-6683	6	17	5910-00-864-8335	3	5
5905-00-126-6694	2	51	5910-00-864-8335	4	5
5905-00-135-3973	2	33	5910-00-864-8335	6	5
5905-00-141-0717	2	47	5962-00-865-4625	2	13
5905-00-141-0743	3	17	5962-00-865-4626	2	19
5905-00-141-0743	5	21	5962-00-865-4631	2	21
5905-00-141-1183	2	29	5940-00-882-9091	1	107
5305-00-151-3164	1	51	5305-00-889-2998	1	69
5961-00-156-0477	5	39	5305-30-889-2998	2	55
5962-00-162-7505	2	25	5305-00-889-3116	1	65
5962-00-162-7505	3	7	6625-00-890-6417	6	3
5340-00-163-6885	1	5	5930-00-902-4150	1	101
5962-00-163-9181	2	15	5961-00-905-2926	1	113
5962-00-175-8943	3	11	5962-00-922-3219	3	9
5935-00-180-1249	1	9	5962-00-927-1749	4	11
5905-00-192-6653	1	105	5365-00-937-0629	1	83
5940-00-192-9962	1	103	5910-00-947-8285	5	9
5310-00-193-7577	1	119	5310-00-950-1310	1	117
5910-00-211-2487	1	3	5305-00-957-2383	1	55
5310-00-225-3042	1	23	5305-00-957-7814	1	59
5310-00-261-7437	1	115	5305-00-983-6730	1	1
5310-00-261-7437	1	134	5305-00-984-4984	1	73
5310-00-298-3881	1	141	5305-00-984-4988	1	75
5950-00-320-7526	1	111	5305-00-984-4989	1	77
5940-00-369-7607	2	17	5305-00-993-0190	1	67
5962-00-369-7621	2	23	5305-00-993-0191	1	63
5962-00-372-0476	2	11	4931-00-008-3427	4	3
5905-00-400-4528	1	43	4931-00-000-3428	5	3

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

NATIONAL STOCK NUMBER INDEX CROSS-REFERENCED TO FIGURE AND ITEM NUMBER

STOCK NUMBER	FIG. NO.	ITEM NO.	STOCK NUMBER	FIG. NO.	ITEM NO.
4931-01-008-3429	2	3	4901-012-2924	3	3

PART NUMBER INDEX CROSS-REFERENCED TO FIGURE AND ITEM NUMBER-Continued

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
AN515-3R6	88044	1	51	RCR07G222JS	81349	6	15
AN935-3L	88044	1	115	RCR07G331JS	81349	6	11
AN935-3L	88044	1	134	RCR07G332JS	81349	1	45
CB1021	01121	5	15	RCR07G332JS	81349	5	11
CB1021	01121	6	13	RCR07G332JS	81349	6	17
C82231	01121	3	19	RCR07G333JS	81349	1	47
CB2231	01121	5	29	RCR07G333JS	81349	5	31
C82711	01121	2	35	RCR07G392J5	81349	3	11
CB2711	01121	6	9	RCR07G392JS	81349	5	21
C88201	01121	6	7	RCR07G393JS	81349	2	45
C11374-440-4	78553	1	35	RCR07G471JS	81349	2	37
DHN13	07126	1	23	RCR07G471JS	81349	5	13
DM15F102G100WVDC	84171	2	9	RCR07G472JS	81349	1	49
JAN1N3612	81349	6	37	RCR07G472JS	81349	2	43
JAN1N746A	81349	6	39	RCR07G472JS	81349	4	15
KLACTCN1500-5PFP0RM10PCT	22701	5	5	RCR07G472JS	81349	5	23
MJE340	04713	6	43	RCR07G472JS	81349	6	19
MPS2369	04713	2	59	RCR07G432JS	81349	2	47
MST105D	95146	1	101	RCR07G4T5JS	81349	2	51
MS24621-9	96906	3	21	RCR07G683JS	81349	5	33
MS24693S2	96906	1	53	RCR07G822JS	81349	5	25
MS2469353	96906	1	55	RCR07G470JS	81349	6	27
MS24693S48	96906	1	59	SNC5490AJ	01295	2	25
MS24693S6	96906	1	57	SNC5490AJ	01295	3	7
MS35206-202	96906	1	61	SN15836N	01295	4	9
MS35206-212	96906	1	63	SN15846N	11295	4	13
MS35206-213	96906	1	65	SN15862N	01295	4	11
MS35206-214	96906	1	67	SN7400N	31295	2	13
MS35206-216	96906	1	69	SN7401N	01295	2	15
MS35206-218	96906	1	71	SN7441N	01295	3	9
MS35206-227	96906	1	73	SN7472N	01295	2	21
MS35206-228	96906	1	75	SN7475N	01295	3	11
MS35206-229	96906	1	77	TE1129	51289	2	7
MS35214-28	96906	1	79	TEL1129	56289	4	5
MS35333-36	96906	1	119	TE1129	80183	3	5
MS35338-39	96906	1	121	TE1129	80183	6	5
MS35338-41	96906	1	123	TIS75	01295	5	39
MS35338-42	96906	1	125	TNT205U050P1A	90201	2	5
M38510-00108BCB	81349	2	11	0-4	80223	1	109
M38510-00202BCB	81349	2	23	1N270	81349	2	57
M38510-00401BCB	81349	2	17	1N270	81349	4	19
M38510/03001BCB	81349	4	7	1N4816	80131	6	31
NAS620-2	80205	1	127	10187815	18876	1	7
NAS620-3L	80205	1	129	1412-6	83330	1	107
NAS620-4L	80205	1	131	1502-5000-00	14010	1	3
NAS620-6L	80205	1	133	1700-5000-03	14010	5	3
NA5620-8L	80205	1	135	1700-5037-03	14010	6	3
NA5671-2	80205	1	25	1700-5139-04	14010	2	3
NAS671-3	80205	1	27	1700-5140-00	14010	4	3
NAS671-4	80205	1	29	1704-5033-99	14010	3	3
NAS671-4	80205	2	27	2N3569	80131	6	41
NAS671-6	80205	1	31	2N3644	80131	6	45
NA5671-8	80205	1	33	2N4410	81349	2	61
PS50D2	21604	1	21	2N4410	81349	3	25
RCR07G100JS	81349	2	31	2VK18D1-2	05514	1	9
RCR07G100JS	81349	3	13	2VK22D1-2	05574	1	11
RCR07G101JS	81349	2	29	2VK601-2	05574	1	13
RCR07G102JS	81349	2	39	2007	71785	1	105
RCR07G003JS	81349	1	37	203-21207-186	94990	2	55
RCR07G103JS	81349	2	53	21PX16	T54T7	1	137
RCR07G103JS	81349	4	17	21PX16	75477	2	63
RCR07G103JS	81349	5	27	2107-4002-01	14010	5	35
RCR07G103JS	81349	6	21	2107-4002-01	14010	6	33
RCR07G104JS	81349	1	39	2605355-2	06424	2	19
RCR07G104JS	81349	6	23	3X5000	63743	6	29
RCR07G105JS	81349	1	41	308087	07980	1	15
RCR07G124JS	81349	1	43	313-250	75915	1	17
RCR07G152JS	81349	5	17	314AG502	91506	3	23
RCR07G153JS	81349	2	49	314AG502R	91506	1	85
RCR07C182JS	81349	3	15	3303	91662	5	37
RCR07G184JS	81349	6	25	3303	91662	6	35
RCR07G221JS	81349	2	33	332-14-08-042	71785	1	103
RCR07G222JS	81349	2	41	40250	86684	1	113
RCR07G222JS	81349	5	19	4521-112-100-2C	86928	1	5

NATIONAL STOCK NUMBER AND PART NUMBER INDEX
PART NUMBER INDEX CROSS-REFERENCED TO FIGURE AND ITEM NUMBER-Continued

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
46256LF	82389	1	99	5606-28-32	86928	1	139
4751-5000-00	14010	1	87	5710-63	86928	1	83
4801-2542-00	14010	1	81	6513	72653	1	141
5001-4	81073	1	91	76FD2CK151	01002	5	7
5002-6	81073	1	97	76FD2EM221	06001	5	9
5101-5000-00	14010	1	93	9190604	18876	1	117
5101-5000-01	14010	1	95	963	82389	1	89
5101-5000-04	14010	1	111				

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APPENDIX B

BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST

Section I
INTRODUCTION

B.1 SCOPE

B.1.1. This appendix lists items which accompany the Flow Transfer Kit, Flow Technology, Inc. Model FT-AFS-4-CF and Anadex Instruments, Inc. Model CF-604-6-8175Q, or are required for installation, operation or maintenance.

B.2 GENERAL

B.2.1. This Basic Issue Items and Items Troop Installed or Authorized List is divided into the following sections:

a Basic Issue Items-Section II. A list of items which accompany flow transfer kit and are required by the operator crew for installation, operation, or maintenance.

b Items Troop Installed or Authorized List-Section III. Not applicable.

Section II

BASIC ISSUE ITEMS LIST

Description	Mfr part No.	Useable on code	Unit of meas.	Qty furn with equip
Cable AC Power	17258-S	18316	1	1
Cable and Connectors 150 ft	C11744	18316	1	1
Cable and Connectors 50 ft	C11745	18316	1	1

APPENDIX C

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C.1 General

This appendix provides a summary of the maintenance operations covered in the equipment literature for the Flow Transfer Kit, Flow Technology, Inc. Model FT-AFS-4-CF and Anadex Instruments, Inc. Model CF-604-6-8175Q. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C.2 Maintenance Functions

Maintenance functions will be limited to and defined as follows:

C.2.1. *INSPECT.* To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

C.2.2. *TEST.* To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc. This is accomplished with external test equipment and does not include operation of the equipment and operator type tests using internal meters or indicating devices.

C.2.3. *SERVICE.* To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

C.2.4. *ADJUST.* To rectify to the extent necessary to bring into proper operating range.

C.2.5. *ALIGN*. To adjust two or more components or assemblies of all electrical or mechanical system so that their functions are properly synchronized. This does not include setting the frequency control knob of radio receivers or transmitters to the desired frequency.

C.2.6. *CALIBRATE.* To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

C.2.7. *INSTALL.* To set up for use in an operational environment such as an encampment, site, or vehicle.

C.2.8. *REPLACE.* To replace unserviceable items with serviceable like items.

C.2.9. *REPAIR.* To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

C.2.10. *OVERHAUL.* Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

C.2.11. *REBUILD.* The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

C.2.12. *SYMBOLS.* The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

C.3 Explanations of Format of Section II, Maintenance Allocation Chart

C.3.1. *Column 1, Group Number.* Not applicable.

C.3.2. *Column 2, Functional Group.* Column 2 lists the

noun names of components, assemblies, subassemblies, and modules on which maintenance is authorized.

C.3.3. *Column 3, Maintenance Functions.* Column 3 lists the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories: The codes used represent the various maintenance categories as follows:

Code	*Manufactures name*
C	Operator/Crew
O	Organizational maintenance
F	Transfer maintenance
H	Reference maintenance
D	Depot maintenance
P	Primary maintenance

C.3.4. *Column 4, Tools and Equipment.* Column 4 specifies, by code, those tools and test equipment required to perform the designated function. The numbers appearing in this column refer to specific tools and test equipment which are identified in Section III.

C.3.5. *Column 5, Remarks.* Self-explanatory.

C.4 Explanation of Format of Section III, Tool and Test Equipment Requirements

The columns in Section III, Tool and Test Equipment requirements, are as follows:

C.4.1. *Tools and Equipment.* The numbers in this column coincide with the numbers used in the tools and equipment column of the Maintenance Allocation Chart. The numbers indicate the applicable tool for the maintenance function.

C.4.2. *Maintenance Category.* The codes in this column indicate the maintenance category normally allocated the facility.

C.4.3. *Nomenclature.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

C.4.4. *Federal Stock Number.* This column lists the Federal stock number of the specific tool or test equipment.

MAINTENANCE ALLOCATION CHART

FOR FLOW TRANSFER KIT MODEL CF-604-6-8175Q

CHART NUMBER MIS-10391

MAC PAGE

GROUP NUMBER	FUNCTIONAL GROUP	MAINTENANCE FUNCTIONS												
		a INSPECT	b TEST	c SERVICE	d ADJUST	e ALIGN	f CALIBRATE	g INSTALL	h REPLACE	i REPAIR	j OVERHAUL	k REBUILD	l TOOL REQD.	m REMARKS
1.	FLOW INDICATOR	F	F	F			F	F	F	F	D		ALL	
2.	TOTALIZER	F							F	D	D			
3.	P C BOARD	F							F	D	D			
4.	COMP LOGIC	F							F	D	D			
5.	P C SUBELEMENT	F							F	D	D			
6.	COMP POWER SUPPLY	F							F	D	D			
7.	P C POWER SUPPLY	F							F	D	D			
8.	COMP AMP	F							F	D	D			
9.	P C AMP	F							F	D	D			
10.	COMP REM PROG	F							F	D	D			
11.	P C REM PROG	F							F	D	D			
12.	TURBINE FLOWMETER, 1/2", MDL. FT-8M10-L3	P					P		P	P	P			
13.	TURBINE FLOWMETER, 1", MDL. FT-16M50-LB	P					P		P	P	P			

SMI FORM 1134, 1 FEB 68 REPLACES AMSMI-S FORM 62, WHICH IS OBSOLETE

MAINTENANCE ALLOCATION CHART

FOR FLOW TRANSFER KIT MODEL CF-604-6-8175Q

CHART NUMBER MIS-10391

TOOLS REQUIRED PAGE

TOOL CODE	CATEGORY	NOMENCLATURE	TOOL NUMBER
1b, 1f, 1i	F	COUNTER, ELECTRICAL DIGITAL 1037M	7910823

SMI FORM 1134-2, 1 FEB 68 REPLACES AMSMI-S FORM 62-2, WHICH IS OBSOLETE

MAINTENANCE ALLOCATION CHART

FOR FLOW TRANSFER KIT MODEL CF-604-6-81750

CHART NUMBER MIS-10391

REMARKS PAGE

REMARKS CODE	REMARKS
A	TEST IN ACCORDANCE WITH CALIBRATION PROCEDURE TB 9-6625-1915-50

SMI FORM 1134-1, 1 FEB 68 REPLACES AMSMI-S FORM 62-1, WHICH IS OBSOLETE

APPENDIX D

CHARACTERISTICS IN LIQUID SERVICE

Each electrical pulse generated by the turbine flow transducer represents a discrete volume of fluid. The relationship between the pulses and a given volume of fluid is given by the meter calibration factor. This meter calibration can be referred to as the "C" factor, and is expressed as "Gallons Per Minute/Pulses Per Second". The degree to which these pulses represent the given volume of fluid at various flow rates determines the transducer's accuracy and repeatability. The variation experienced in this pulse-volume relationship over a specified flow range defines the transducer's linearity. This "ideal" performance is generally achieved when the kinematic viscosity of the liquid is in the range of 0.5 to 2 centistokes. If the flowmeter is used with liquids having viscosities greater than 2 centistokes, the "C" factor will be increased. This effect is sometimes referred to as "viscosity drag" or "viscosity shift". This shift can also be shown in a plot of flow rate versus output frequency (See Figure 14). Note that the higher the viscosity, the greater the shift. (Figures 13 & 14 are exaggerated and considered to be examples only).

Since it is desired to use turbine flowmeters with several liquids, it is necessary to determine a universal viscosity calibration curve (See Figure 15). From this curve one can determine the performance of the flowmeter when used with liquids that cover a large viscosity range. Data needed for the universal viscosity curve is determined through calibrations using several different viscosities. This can be one liquid at different temperatures or several different liquids. The data points, when plotted on one set of coordinates, will overlap and form a smooth composite curve. Using this curve the performance of the flowmeter can be determined for any frequency (Hz) or viscosity (V) if the Hz/V value is within the range of the data used in determining the curve. The correlation of data obtained from actual calibration and data taken from the universal curve when using oils and hydrocarbons is ±0.25%.

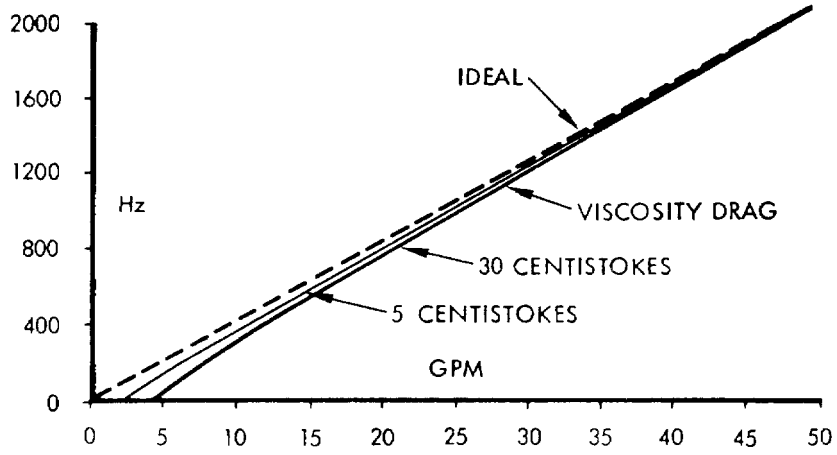

FIGURE 13
VISCOSITY DRAG

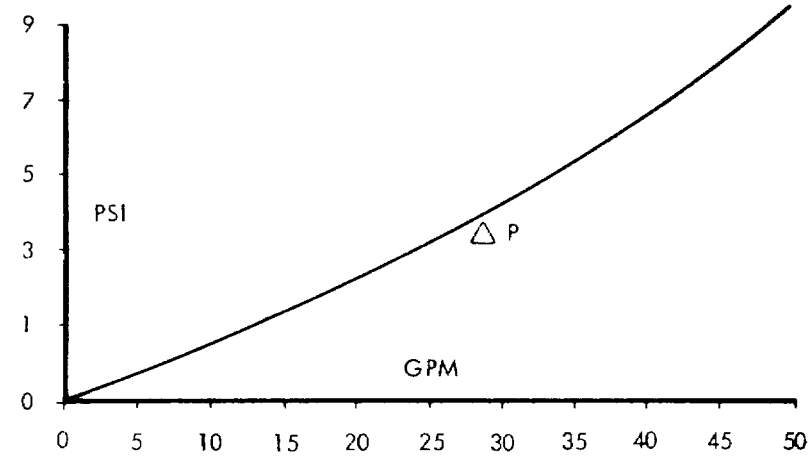

FIGURE 14
DIFFERENTIAL PRESSURE-CURVE

5 PS! drop at maximum rated flow with water at 70°F. For estimating pressure drop on other liquids use the Following equation:

$\Delta P = 5 \times [\text{viscosity (CPSE)}]^{1/4}: \times [\text{Sp. Gr.}]^{3/4}$ PSI

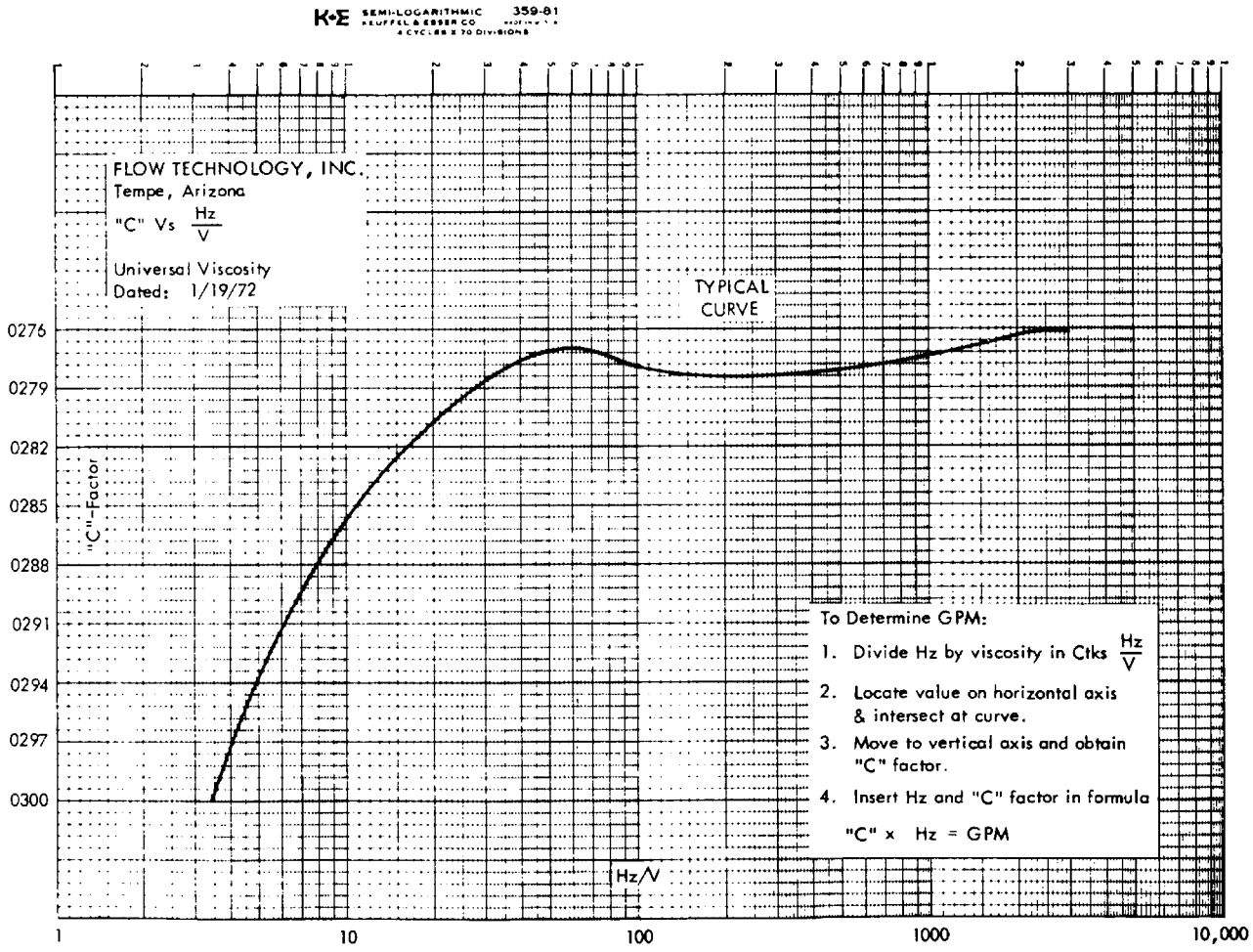

FIGURE 15
UNIVERSAL VISCOSITY CURVE

APPENDIX E

LIQUID FLOW MEASUREMENTS AND CAPABILITIES OF THE SECONDARY TRANSFER TEAMS USING TURBINE FLOWMETERS

E.1 Purpose and Scope

This appendix provides information on the operation of turbine flowmeters as a standard in the calibration of liquid flow measuring instruments. It is not to be used as a calibration procedure, but may be used as a guide for training in the use of the turbine flowmeter.

E.2 Specifications

The flow range is 1.0 to 50 gallons per minute, approximately 400 to 20,000 pounds per hour.

E.3 General Instructions

The rate of flow in gallons per minute is computed from the measurements made with the flow transfer standards. The rate of flow in pounds per hour is computed from the basic measurements and the specific gravity of the fluid at operating temperature.

The flow transfer standards are precision instruments consisting of two ranges of turbine flowmeters with an overall range of 1.0 to 50.0 gallons per minute. Each of the turbine flowmeters provides flow measurement over a 0.5 to 30.0 centistoke viscosity range with an accuracy of +0.35 percent of indicated volumetric flowrate. Each flow transfer kit contains, in addition to the flow standards, flow straightening sections and a digital indicator.

The operation and data collection procedure for the two ranges of turbine flowmeters is identical. The range of operation is initially determined and the appropriate size standard flowmeter installed in series (with arrow pointing in direction of flow) with the test instrument. Install the filter provided upstream of the 1/2 inch meter prior to operation of the fluid source. The throttling valves on the fluid source (test stand, etc.) must be closed at the start of the calibration to prevent overranging and subsequent damage to the standard flowmeter. Prior to a calibration run, the fluid in the test stand must be checked for cleanliness and changed if contaminated.

The majority of the flowmeters requiring calibration will be variable area flowmeters consisting of a float in a tapered glass tube. The float assumes a position in the glass tube where the exposed cross sectional area of the tube has a direct relationship with the rate of flow. The position of the float, therefore, indicates the rate of flow. These flowmeters are generally designed with a linear relationship between the rate of flow and the position of the float. The usable range of a variable area flowmeter is from 10 percent to 100 percent of its maximum capacity. For best repeatability, the range should be limited to 20 percent to 100 percent of maximum capacity. These types of meters are sensitive to changes in fluid density and viscosity. Since the position of the float in a variable area flowmeter is dependent on the density and viscosity of the fluid as well as the rate of flow, the fluid used must have properties similar to the fluid to be metered by the test instrument.

A second type of flowmeter is a turbine flowmeter that has its own indicator, or can be read with an available frequency counter. The frequency output of turbine flowmeters is proportional to the rate of flow. For best repeatability, the test instrument should be limited to a range of 10 percent to 100 percent of maximum capacity. Other types of liquid flowmeters can be calibrated, provided their range and operational fluid is compatible with the flow standards. Refer to the test instruments manual for specifications and operational instructions.

E.4 Equipment Required

Table E-1 lists equipment required for calibration performance checks and adjustments. Refer to it for specific item identification and specifications for selection of alternate equipment.

Verify that the test instrument is in good physical condition, clean, and free from defects that would impair its operation (such as nicks on the float and bent float extension, and if the test instrument is a variable area flowmeter). Other types of flowmeters will generally have erratic output after damage occurs.

If the test instrument has an accessory indicator, verify that the accessory is in acceptable condition and is adjusted according to the manufacturer's instructions.

Inspect the fluid in the fluid source (test stand, etc.) for cleanliness. If any dirt or entrained particles are present, the fluid must be drained, the system must be

cleaned and refilled with clean fluid. Failure to perform this inspection could result in damage to the standard flowmeters.

E.5 Volumetric

Operate the test instrument prior to insertion of the standard flowmeters. Determine the correct valves for controlling flow rate to the test instrument flowmeter and close the valves. Determine the volumetric flowrate range of test instrument and select the appropriate size standard flowmeter.

Install the correct size standard flowmeter in line with the test instrument, being careful not to cross thread the meter. Insure that the direction flow arrow on the standard flowmeter is pointing in the correct direction. The flow straighteners are to be installed in their correct position and the thermometer (A5, table E.1) is to be installed, in line, upstream of the standard flowmeter. The filter is to be installed upstream of the standard flowmeter. Connect the standard flowmeter to its flow indicator and allow sufficient time for the instrument to warm up. Refer to the manufacturer's manual for the correct operating procedure for the flow indicator.

Select ten approximately equally spaced calibration points at cardinal divisions through the range of the test instrument. Record the selected values in column 1 on the flow data sheet (table E.2). Allow four lines for each calibration point selected.

Initiate operation of the fluid source (test stand, etc.) and open the bypass line until the fluid temperature stabilizes at the desired test temperature (this temperature will probably be etched on the test instrument scale or its readout device). If no bypass line is available, the flowmeter should be removed until the temperature is stabilized. After the temperature has stabilized, close the bypass valve and slowly open the flow control valve until the lowest test point is reached. Allow the temperature of the system to restabilize before taking readings.

Record the fluid temperature and the standard flowmeter's frequency in the appropriate flow data sheet columns. Take three frequency readings at this flowrate setting on the test instrument and average the data.

Repeat the procedure of the preceding paragraph above for each of the ten selected cardinal points on the test instrument flowmeter. Record all data. Collect a sample of the fluid from the test stand in a clean container. Select the correct viscometer from the viscometer set (A2, table E-1). The approximate fluid viscosity is usually etched on the test instrument. Fill the viscometer with the test fluid, according to the manufacturer's instructions. If the viscometer is not filled correctly, the viscosity value determined will be in error. Place the charged viscometer and thermometer (AG, table E-l) in the viscometer bath (B1, table E.1) an(d set the bath control to the test fluid operating temperature recorded on the data sheet. Following the manufacturer's instructions, determine the viscosity of the test fluid in centistokes. Record this value on the flow data sheet.

Divide the average standard flowmeter frequency for each test point on the test instrument by the viscosity to determine a value for F/V and record these values (F/V is the standard flowmeter viscous influence factor). Refer to the calibration table supplied with each standard flowmeter, determine and record a C value for each F/V value. Multiply each of the C values by their associated frequency to obtain flowrate in gallons per minute (gpm)n. The following equation applies for this calculation: GPM = C x F, where C is the calibration factor for the flowmeter and F is the output of the flowmeter in cycle. per second. If the test instrument is scaled in volumetric units other than gpm, approximate conversions must be made to generate compatible units.

E.6 Mass Flow

Perform E-5 to obtain the volumetric flow units for the test instrument.

Collect a sample of fluid from the test stand and measure its specific gravity with the correct range of hydrometer from the hydrometer set (A3 or A4, table E.1). Determine and record the temperature at which the observed specific gravity is measured with (A6, table E.1). Refer to table 23 of the API Petroleum Measurement tables and determine the specific gravity of the test fluid at $60^{o}/60^{o}$ F by entering the table with the previously observed specific gravity and the observed temperature. Record this value.

Refer to table 24 of the API Petroleum Measurement tables and determine the volume reduction factor for the test fluid. This is performed by entering the tables with the specific gravity at $60^{o}/ 60^{o}$ F and the temperature at which the flowrate measurements were made. Record this value. If the temperature changed during the calibration, a volume reduction factor must be obtained and recorded for each temperature.

Perform the following calculation: Specific gravity at operating temperature = specific gravity at $60^{o}/ 60^{o}$ F volume reduction factor. Record these values in column

12 of the flow data sheet. Perform the following calculations to obtain the mass flow rate ill pounds per hour (pph): PPH = GPM x 499.7 x SG at operating temperature, where 499.7 = weight of water at 60°F in pounds per gallon x 60 min/'hr.

NOTE

Do not attempt to dry the standard flowmeters by blowing compressed air through the rotor assembly. Compressed air will overspeed the rotor and result in damage to the flowmeter.

E.7 Specific Item Identification (Transfer)

Table E.1 identifies each item by nomenclature, identifying number, and description as issued with secondary transfer calibration standards set 4931-621-7877. When any of the equipment listed in table E.1 is not available, equivalent items may be substituted.

Table E.1 Equipment Standards

Item	Nomenclature	Identifying Number	Description
A1	KIT, FLOW TRANSFER	MIS-10391A	Range: 1.0 to 50 gpm Accuracy: ± 0.35% R
A2	VISCOMETER SET	7913076	1%
A3	HYDROMETER KIT	7907391	.2%
A4	HYDROMETER ASTM 82H 62	7913264	.2%
A5	BIMETAL THERMOMETER	MIS-10320	± .5°F
A6	THERMOMETER	8032312	± .7°F
	Accessories		
B1	THERMOELECTRIC BATH	MIS 10:322	
B2	FLOW ACCESSORIES SPARE PARTS KIT	79133:10	
B3	FLOW FITTINGS KIT	7913417	

Table E.2 Flow Data Sheet

(1) TEST INSTRUMENT	(2) STD METER F (CPS)	(3) OPERATING TEMP (°F.)	(4) V VISCOSITY (cs)	(5) F/V	(6) C	(7) GPM	(8) OBSERVED SPECIFIC GRAVITY	(9) OBSERVED TEMP. (°F.)	(10) SPECIFIC GRAVITY 60°/60°F.	(11) VOLUME REDUCTION FACTOR	(12) SG O.T.	(13) PPH

(5) = (2) ÷ (4), (7) = (6) × (2), (12) = (10) × (11), (13) = (7) × 499.7 × (12)

NOTE: NUMBERS WITHIN CIRCLES IDENTIFY COLUMNS.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 022714-000