Catalog A-90C

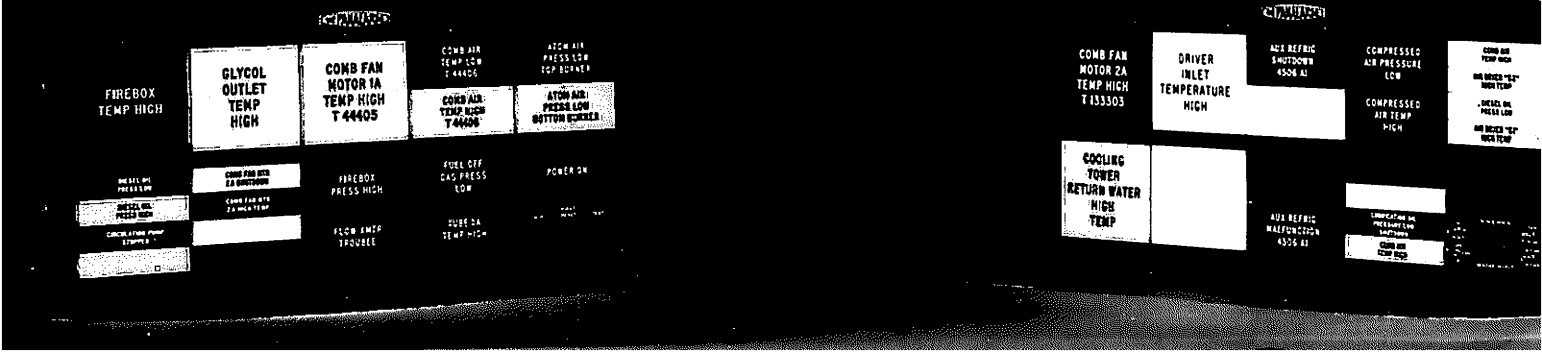

# SERIES 90

## A Technological Advancement in Versatile Annunciation With Complete Analog Monitoring Capability

# SERIES 90

## Contents





# Anticipatory Engineering Achieves Unrivaled Application Versatility

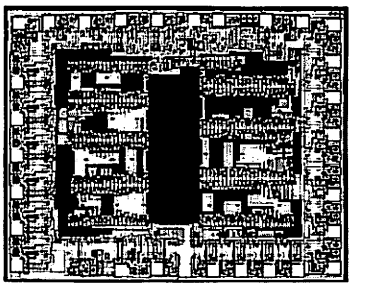
Acknowledging that progress is on-going and often has an impact on application requirements, PANALARM engineers have designed into Series 90 the capability of coping with change. In effect, Series 90 anticipates potential changes in requirements by offering the versatility for customized modification, now or later, with a *standard* annunciator system.

To achieve this engineering philosophy, PANALARM's highly advanced Series 90 combines I²L custom microchip logic with microprocessor technology to deliver flexibility through a multitude of on-board and remote options. This permits the freedom and economy of limitless customizing of small or even the largest most complex systems from *standard* modules.

Series 90 has the inherent versatility to provide six capabilities; (1) standard annunciation; (2) integral or remote logic architecture; (3) input/output functions for customer customizing; (4) meter set (digital readout and point selection) analog monitoring; (5) blind set analog monitoring; and (6) RS-422 computer interface.

## LOGIC

**Linear and digital I²L circuitry combined on same chip.**



The innovative combination of I²L microchip logic and microprocessor technology provides integrated circuit logic cards with inherent customizing capabilities to perform any desired system function. I²L and linear design techniques used provide a means for reliable interface, circuit protection and excellent noise immunity.

Dedication of a single custom IC per point eliminates the multipoint failure possibility present with common logic point cards. Even with twinpoint logic cards, dedicated IC logic per point is used to isolate point monitoring functions.

In addition to the nine standard operational sequences described on Pgs. 14 and 15, the IC can be custom programmed to provide many other sequence variations which enhance system performance by supplying additional information.

Some of the multiple options available by customizing the IC card include integral auxiliary relays; optical isolation for AC or DC inputs and output switching; field voltage disconnect upon card removal; card status indicator; relay lockout on test; transistor switch output for computer or PC interfaces; reflash; slave lamp output for remote indication; and on/off indication for status applications. Many of these options are detailed on Pgs. 18 and 19.

# Description Of SERIES90 System Concept

By utilizing modular package design, combined with I²L microchip logic and microprocessor technology, PANALARM's standard Series 90 provides more features than any other system available.

This unsurpassed versatility permits complete engineering freedom in original system design or in subsequent field modification. You specify the features required, without paying for additional unwanted features forced on you by rigid design. Yet extra features may be added later, simply and inexpensively.

## The Module

Each module houses cards, terminals, and bus wiring for up to four points. The lightbox housing mounts to the front of the module. Nameplates snap onto the lightbox. Single, dual, triple and quad nameplate configurations per module are offered in a choice of colored nameplates or colored filters (behind standard white nameplates) for color coding. Modules can be arranged in matrix fashion up to 10 high by 10 wide in flush, wall or rack mounting configurations.

For analog monitoring, a unique two card system enables each module position to be used for any input function available in Series 90, thus permitting field change of annunciator point requirements by simple card substitution or addition.

A sequence card (one or two points per card) is located in module slot A and/or C depending upon requirements.

An analog card is then positioned in module slot B and/or D. The analog card receives the transducer signal and compares it to predetermined setpoints. The analog card is designed to provide complete input/output and line isolation enabling use of grounded or ungrounded sensors. Internal crossover communication links in the main bus plane are provided between adjacent card slots (A and B/C and D) for connection of the sequence and analog card interface. No customer wiring is required for the sequence/analog card set interface. All calibration is achieved via front access twenty turn pot adjustments and plug-in jack reference read and calibration points.

## The Sequences

Nine operational sequences are standard, although over 40 additional sequences are available. Standard single point cards utilize an I²L custom microchip per card to provide sequence logic and initiate auxiliary functions. Twinpoint cards are furnished with two independent circuits per card to eliminate the risk of multiple point loss.

## Input/Output Functions

Series 90 provides seven terminals per card position for user input/output functions. Integrally mounted input options for dry contacts, transducers, or special signal devices and voltages permit user customizing to satisfy practically any input requirement. The capability to accept a variety of input types allows Series 90 to directly monitor those variables which previously required an interposing device or were not independently monitored.

Integrally mounted output options allows the same flexibility in the form of dry contacts, optical couplers, electronic signals and transistor switches for interface to other instrumentation.

Analog input signals from thermocouples, RTDs, load cells (strain gauge), thermistors, active (4 wire) or passive (2 wire) voltage or current transducers are received directly into Series 90 systems in any combination. The signal is monitored by the analog input card which then communicates setpoint information to the annunciator sequence card.

## Communication Link System

Series 90 cabinets and remote chassis can be furnished as communication link systems allowing full duplex RS-232/422/485 communication with your computer. With this option, your computer can show cabinet window displays, event printouts, analog point trending graphs, selective logs, activity lists (status transmission on request), critical lists (priority interrupt transmission), complete analog input point data, etc. Request PANALARM Bulletin 90RS for complete details.

## Remote Logic/Split Architecture

Series 90 remote logic chassis, racks and lamp cabinets are particularly suited for larger systems and limited space applications. Rack mounting in 19" chassis will house 20 cards. Using twinpoint cards, this permits up to 40 points of annunciation in a compact area. Each module in the lamp cabinet can be divided into as many as eight individual indications for panel space savings and console mounting applications.

## Approvals/Listings/Certifications

Series 90 systems are formally listed for use in general purpose applications and as non-incendive, for use in Class I, Division 2 locations. Additionally, wall mount and panel mount enclosures suitable for purging (for Class I, Division 1 locations) are available. Appropriate intrinsic safety barriers are approved for use with signal input devices located in Class I, Division 1 locations. Contact your local PANALARM representative or the factory for further information (Ref. Bulletin ALC, Approvals/Listings/Certifications Guide and Bulletin 201-ISB, Intrinsic Safety Barriers)

# SERIES90 Features

## General

- High density packaging.
- Seven terminals per card position for customer use.
- 1, 2, 3, or 4 cards per module.
- Universal bussing permits system modification, expansion, or change of inputs and outputs in the field.
- Continuous solderless bussing of unique design with a minimum number of actual connections.
- Front access logic cards.
- Totally enclosed rear access terminals provide safety and protection of incoming field wiring on standard integral systems.
- Card status indication and auxiliary relay lockout on test options.
- Single or twinpoint plug-in cards for integrity, reliability and economy (dedicated point circuitry).
- On board L.E.D. diagnostic indicators.
- Alarm priority recall eliminates loss of alarm information for points that alarm during functional test.
- Derated component design for high reliability and extended operating life.
- Integral or remote logic and power supplies.
- Integral or remote pushbuttons.
- Pull-out bezel for easy lightbox removal.
- Four methods of point color coding.
- Modular construction, any matrix configuration up to 10 high by 10 wide.
- Flush, wall or rack mounting.

## Sequence Cards

- Power disconnect to field contacts upon card removal.
- Direct interface capabilities to programmable controllers, microprocessors and computer control systems.
- Nine standard operational sequences plus variation options to meet application needs. Includes, but is not limited to, ISA standard sequences.
- Integral relay contacts, electronic signal, transistor switches or optical couplers for auxiliary outputs.
- AC or DC direct input capabilities on a per point basis (optically isolated).
- Field selectable NO or NC signal contact actuation.
- Reflash, time delay, optical coupler input, power failure monitor and power transfer options can easily be incorporated into the system.

## Analog Cards

- Complete point-to-point electrical isolation.
- On-line, front access calibration.
- Customer selectable High-Low trip point monitoring.
- Independent alarm and trip setpoints.
- Single or dual setpoints per transducer input. Up to four setpoints can be accommodated in one module position from a single transducer or two transducers each having two setpoints.
- Auxiliary contacts available (integral) on annunciator sequence card (NO or NC).
- Sensor failure indication and alarm.
- Continuous monitoring of field sensors.

## Additional Features Of Blind Set (Code AB) Analog

- Field changeable from standard dry contact monitoring to analog monitoring by simple card substitution. No additional rewiring other than field input device connections.
- Customer selectable monitoring ranges (most input types).
- Customer selectable deadband.

## Additional Features Of Meter Set (Code AD) Analog

- Microprocessor-based, continuous monitoring digital display readout. Plus symbol display for °C, °F, engineering units (E), or custom symbols (consult factory).
- Display shows: status of point (alarm or normal), setpoint monitored as High or Low, ambient temperature in °C/°F at cold junction for T/Cs, and line resistance for RTDs; diagnostic codes for display-to-point communication; beyond limit High or Low indication; sensor failure indication; point select identification by dim illumination of module position addressed.
- One digital display handles all input transducers.
- Electronic, self-checking drift correction to High and Low limit references.
- Analog output of 4-20mA and/or 1-5V, isolated from system supply voltage. Segment expansion permits minimum of 20% of monitored span to be expanded to full output range (positioned at any part of input span).

## Custom Integrated Circuit For Sequence Cards

All operational sequences are generated by a custom integrated circuit (IC) which is the heart of each sequence card alarm point. This IC is available in two package sizes, 16 pin and 28 pin. Both sizes have similar internal logic, except the 28 pin version has increased sequence capability and output functions. Prior to January 1992, sequence card model numbers ended in odd and even numbered GP designations, e.g., 1GP, 2GP, 4GP, 8GP, etc. Odd numbered GP's were used to indicate the use of the 28 pin IC; even numbered GP's were used to indicate the use of the 16 pin IC. As stated, these designations are no longer used as part of the sequence card model number.

# SERIES90 General Specifications

## Mechanical

**Packaging:** All plastics are U.L. 94-VO rated.

**Buses and Terminals:** Bright tin plated copper alloy.

**Terminal Connection:** Barrier type terminal rows located vertically behind each card slot (see illustrations on pages 16 and 17). Terminations are made to slotted binder head #6-32x3/8" long screws. Barrier spacing permits use of lugs up to 5/16" wide.

**Cabinets:** 16 gauge steel. Baked black enamel (flush mounted units) or zinc plated blue chromate dipped (remote chassis).

**Construction:** NEMA 1 ventilated (flush mount units). (NEMA 12 and NEMA 4 available, consult factory)

**Knockouts:** 3/4" conduit, one per row each side and one per column top and botton.

**Temperature Range:**
Operating: 0 to 50°C Ambient (32 to 122°F)
Storage: -40°C to +85°C (-40 to 185°F)
Humidity: 10% r.h. to 95% r.h., non-condensing.

## Electrical

**Power Supply:**

| Input Voltage | | Input Voltage Min. | Input Voltage Max. | Available Signal Contact Voltage |
|---|---|---|---|---|
| 120 AC 50-60 Hz | | 105 | 130 | 24, 48 or 125 VDC |
| 240 AC 50-60 Hz | | 210 | 260 | 24, 48 or 125 VDC |
| 220 VDC | 20% maximum allowable ripple | 200 | 250 | 24 VDC |
| 125 VDC | | 105 | 140 | 24 or 125 VDC |
| 48 VDC | | 40 | 64 | 24 or 48 VDC |
| 24 VDC | | 20 | 32 | 24 VDC |

**System Logic Voltage:** 24 VDC (25.5 VRMS ±15% unfiltered DC).

**Lamps:** Nominal 28 V, 40 mA per lamp. #85 subminiature wedge base (T 1-3/4).

**Loading (Watts):** Sequence Card:
(28 Pin) Single Point 1.3 W Twinpoint 2.6W
(16 Pin) Single Point 0.9 W Twinpoint 1.8W
Single point, 24FC with T, NL, KN or KP input, add 0.072 W
Twinpoint, 24FC with TA, TB, NL or KN inputs, add 0.144 W.
Analog Input Card (Meter Set): Single setpoint, or dual setpoint, 2.5W; (add 0.75W for LC or PXD inputs).
Analog Input Card (Blind Set): Single setpoint, or dual setpoint, 2.3W; (add 1.0W for LC or PXD inputs).
Analog Output Card: Single output, or dual output, 3W.
Digital Display: 9.5W.
Lamp Load: 1 watt per lamp. (2 lamps per point or window indication except 91LA or 91LBX which has 4 lamps, i.e., 91LA01, 4 W load; 92LA01, 4 W load; 93LA01, 6 W load; 94LA01, 8 W load).
Integral Auxiliary Relay (Coil): 0.5 W load.
Integral Output Optical Coupler: 0.4 W load.

## Sequence Card Signal Inputs

**Leakage/Series Resistance:**

| Nominal Input Voltage | % of Nominal without Component Damage | Maximum Current | Maximum Series Resistance | Minimum Leakage Resistance |
|---|---|---|---|---|
| **Type T and NL (Dry Contact Input)** | | | | |
| 12 VDC | 200% | 3 mA | 6.5 KΩ | 60 KΩ |
| 24 VDC | 200% | 3 mA | 6.5 KΩ | 45 KΩ |
| 48 VDC | 200% | 3 mA | 5.0 KΩ | 65 KΩ |
| 125 VDC | 135% | 3 mA | 5.0 KΩ | 150 KΩ |
| **Type KN (Optical Isolator)** | | | | |
| 5 VAC/DC | 200% | 3 mA | 1 KΩ | 10 KΩ |
| 12 VAC/DC | 200% | 3 mA | 10 KΩ | 10 KΩ |
| 24 VAC/DC | 200% | 3 mA | 10 KΩ | 25 KΩ |
| 48 VAC/DC | 200% | 3 mA | 10 KΩ | 50 KΩ |
| 120 VAC | 200% | 3 mA | 10 KΩ | 100 KΩ |
| 125 VDC | 200% | 3 mA | 10 KΩ | 100 KΩ |

**Note:** Maximum series resistance and minimum leakage resistance values are valid if field contact voltage is ±15% of nominal.

**Surge Withstand Capability:** Signal contact voltages of 24V or higher tested and passed per ANSI/IEEE C37.90-1978 (SWC).

**Radio Frequency Interference Susceptibility:** Systems with K, NL and T type signal inputs and 120 VAC power input (all external wiring shielded ) designed to meet SAMA PMC 33.1-1978, Class 2, Bands b & c (10 volts per meter from 50 MHz to 1000 MHz).

**KN Isolation:** Optical coupler input, 1066 VRMS continuous and 1770 VRMS surge.

**Standard Response Time:** 20 mS ± 3 mS.

**Resolution Time:** (First Out Sequences) 6 mS.

**Optional Time Delays (for Input Response):** 2 mS to 500 Sec.

**Pushbutton Interlock:** Operating a pushbutton out of its proper sequence will not affect sequence card function.

**Test:** Full functional (lamp test only, optional).

## Sequence Card Outputs

**Integral Relay Contacts:** 5A @ 120 VAC or 28 VDC (resistive). Form A, B, or C available

**Optical Coupler Output:** KT, KC, KE. Transistor rated 30 VDC, recommended max. voltage 18 VDC. Max. current 5 mA. Saturation voltage 0.3 V @ 5 mA.

**Electronic Output (E*):** Open collector (NPN) emitter tied to system common. Outputs low when active. Rated 20VDC (24 max.), 10mA max. Vce Sat. 2.0 V @ 10mA. Leakage current less than 5μA @ 18 VDC.

# SERIES90 Specifications

## Meter Set Analog Cards

**Voltage:** 0.2 to 1, 0 to 1, 1 to 5, 0 to 10, -5 to +5, -10 to +10 and -1 to +1 VDC.

**Current:** 0.4 to 2, 1 to 5 and 4 to 20 mA.

**RTD:** 100 ohm Pt (DIN Standard) @ 0°C; 10 ohm Cu @ 25°C; 120 ohm Ni @ 0°C; and 100 ohm Ni (DIN Standard) @ 0°C, 2, 3, or 4-wire.

**Thermocouples:** Types J, K, T, E, R, and S. Cold junction compensation (90ATB1) is provided and linearization of output is included.

**Load Cell (Strain Gauge):** Ƶ >350 ohms output, 3.5mV/V to 5.0mV/V bridge excitation @ 10V; Ƶ >180 ohms output, 7.0mV/V to 10mV/V bridge excitation @ 5V.

**Thermistor Inputs:** Thermistors listed (or ones with equal resistance-temperature curves and repeatability) are recommended.

| Fenwal Part Number | Yellow Springs Inst. Part Number | Range °C | Resistance in ohms @ 25°C |
|---|---|---|---|
| UUD21J1 | 44001A | -70 to + 25 | 100 |
| UUD23J1 | 44002A | -50 to + 60 | 300 |
| UUB25J1 | None | -40 to + 75 | 500 |
| UUB31J1 | 44003A | -25 to + 90 | 1000 |
| UUA32J3 | 44004 | -10 to +115 | 2252 |
| UUA33J1 | 44005 | 0 to +125 | 3000 |
| UUA35J1 | 44007 | +10 to +150 | 5000 |

**Response Time:** 400mS, except for RTD inputs (2 sec., max). Expanded time delays available.

**Sensor Lead Resistance:** Voltage monitoring up to 900 ohms. Current monitoring up to 10 ohms (5 ohms for copper RTD).

**Input Impedance:** 1 megohm.

**"Channel" Isolation:** Input, output and line isolation provided by on-board power supply and optical couplers.

**Common Mode Rejection:** Analog input to system common, 90 db. (0 to 20 KHz).

**Setpoint Accuracy:** ±0.1% of span.

**Setpoint Adjust:** 20 turn pot with setpoint reading on digital display.

**Repeatability:** ±0.1% of span.

**Deadband:** Standard 1%; optional 0.5, 2, 5, or 10% of span (factory set).

**Measuring Circuit**

***Temperature Stability:*** ½ digit from 0° to 50°C ambient.

***Input Line Effect:*** Less than 0.05% of span for ±10% change in line voltage.

***Resolution:*** ±½ digit.

## Analog Output Features

Digital meter readout, annunciator visual and audible alarms and auxiliary outputs (contact, optical coupler or electronic), isolated analog output (1-5V and/or 4-20mA linearized), digital output (consult factory).

**Trip Modes:** Single High or Low; dual High-High, High-Low, or Low-Low. Up to four setpoints may be used for one input.

**Meter Readout:** Digital display; °C, °F, or 0 to 100% linear or square root. Engineering units and special ranges also available. Consult factory.

***Additional Display Data:*** Point value, setpoints, display check, point transducer type, point alarm status, point High or Low setpoint, cold junction temperature for thermocouples and lead resistance for RTDs.

**Digital Display Accuracy:** ±1°C. Microprocessor based with Auto Zero circuit for self-calibration check.

**Analog Output Accuracy (% of Span)**

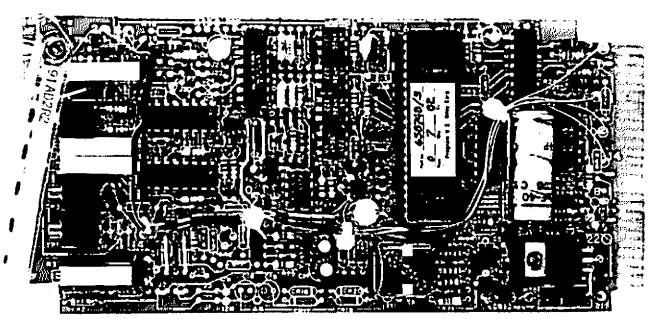
***Temperature Stability:*** ±0.5% of span from 0° to 50°C.

***Linearity:*** ± 0.2% of span.

***Repeatability:*** 0.2% of span.

***Compliance:*** 15V @20mA.

***Output Impedance:*** Less than 1 ohm (1 to 5V).



# SERIES90 Specifications

## Blind Set Analog Cards

**Voltage:** 0 to 1, 1 to 5, 0 to 10, -5 to +5, -10 to +10, and 0.25 to 1.25 DC.

**Current:** 0.4 to 2, 1 to 5 and 4 to 20mA.

**RTD:** 100 ohm Pt @ 0°C (DIN Standard), 10 ohm Cu @ 25°C, 120 ohm Ni @ 0°C; 2, 3, or 4-wire.

**Thermocouples:** Types J, K, T, E. Cold junction compensation (90ATB2) is provided and upscale thermocouple open indicataion is standard.

**Load Cell (Strain Gauge Bridges):** Input span, 2 to 5 mV/V max., excitation 10.0 VDC for 350 ohm (or greater) bridge impedance. 4 to 10 mV/V max., excitation 5.0 VDC for 180 ohm (or greater) bridge impedance.

**Thermistors:** Same as meter set. See chart Pg. 5.

**Response Time:** 150 ms min., 225 ms max.

**Sensor Lead Resistance:** Voltage monitoring up to 900 ohms. Current monitoring up to 10 ohms (5 ohms for copper RTD).

**Input Impedance:** Thermocouple, 1 megohm; voltage signal, 1 megohm.

**"Channel" Isolation:** Input, output and line isolation provided by on-board power supply and optical couplers.

**Setpoint Accuracy:** ±0.2% of span.

**Setpoint Adjust:** 20 turn pot.

**Deadband:** Standard by jumper blocks to 0.5, 1, 2, 5, or 10% of span (unless otherwise specified, factory set for 1%).

**Ambient Temperature Stability:** Less than 2% of span change per 25°C change in ambient.

**Input Line Effect:** Less than 0.05% of span change per 10% change in line voltage.

**Trip Modes:** Single High or Low; dual High-High, High-Low, or Low-Low. Two dual setpoint cards may be paralleled to obtain four setpoints for one input.

## System Common Outputs:

Annunciator visual and audible alarms and auxiliary outputs (contact, optical coupler, electronic). (Also, see Pages 20-23 and Pages 33-35.)

**Flasher/Audible Output Card:**

Load: 1.5W (1DN option, add 0.5W).

Audible Signal Output: Open collector (NPN). 40 VDC max., Vce Sat. 0.6 V @ 250 mA. Current limited to approx. 0.4 A., including any capacitive inrush. Leakage less than 1μA @ 40 VDC.

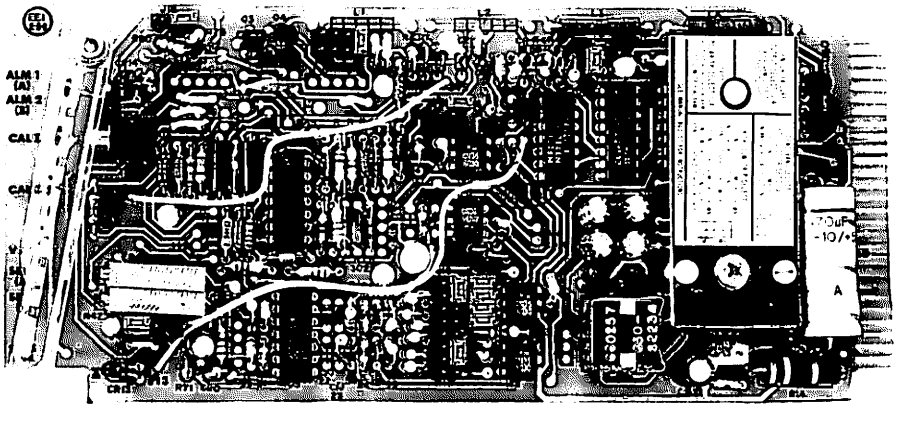
Flash Rates: Fast flash 4 Hz ± 15%, slow flash 1 Hz ± 15%.

Capacity: 300 points

**Remote Auxiliary Relay:** 90AX1 or 90AX2. 3 Form C contacts.

Load (Coil): 1.5 W.

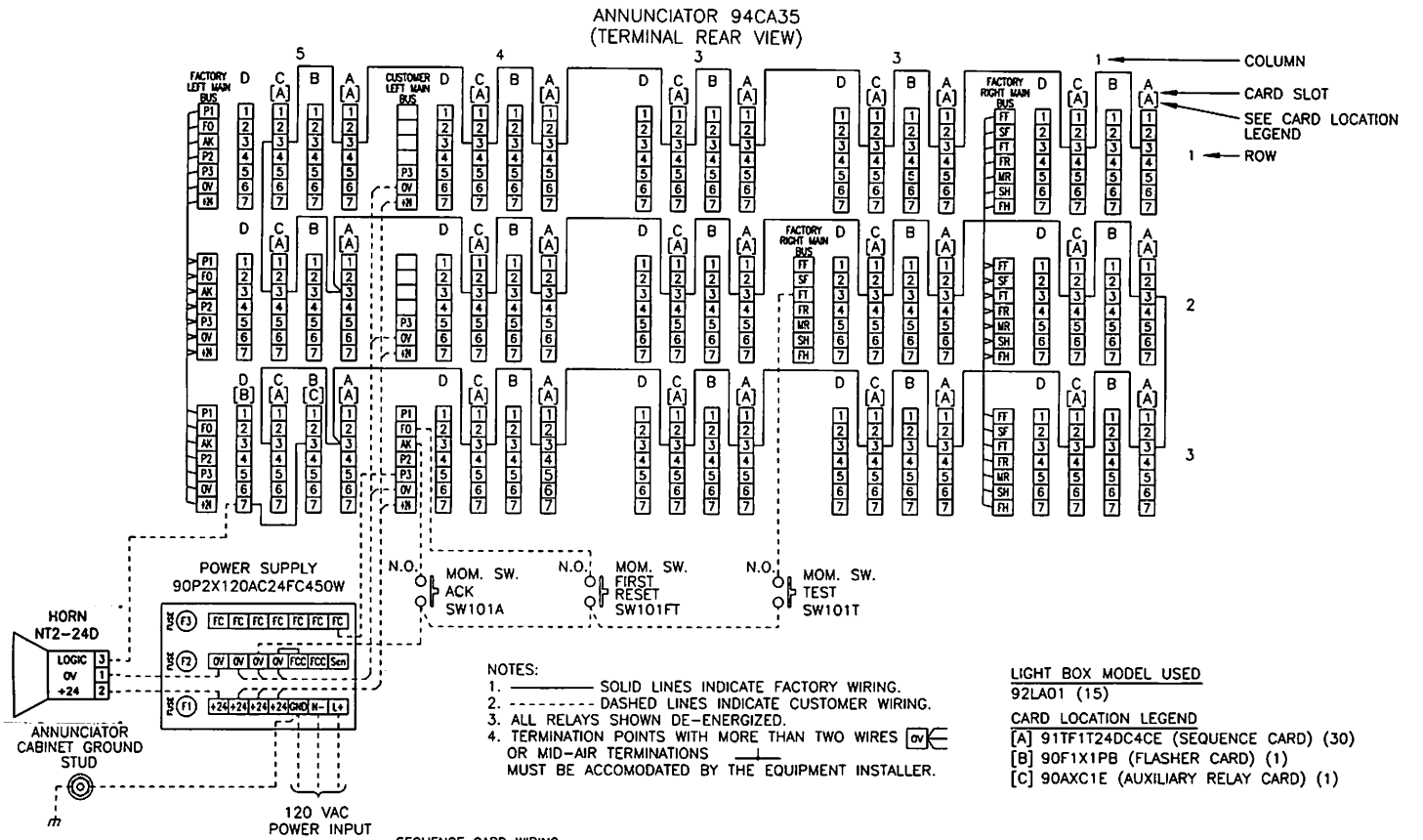
Contact Rating: 5 A @ 120 VAC or 28 VDC (resistive).

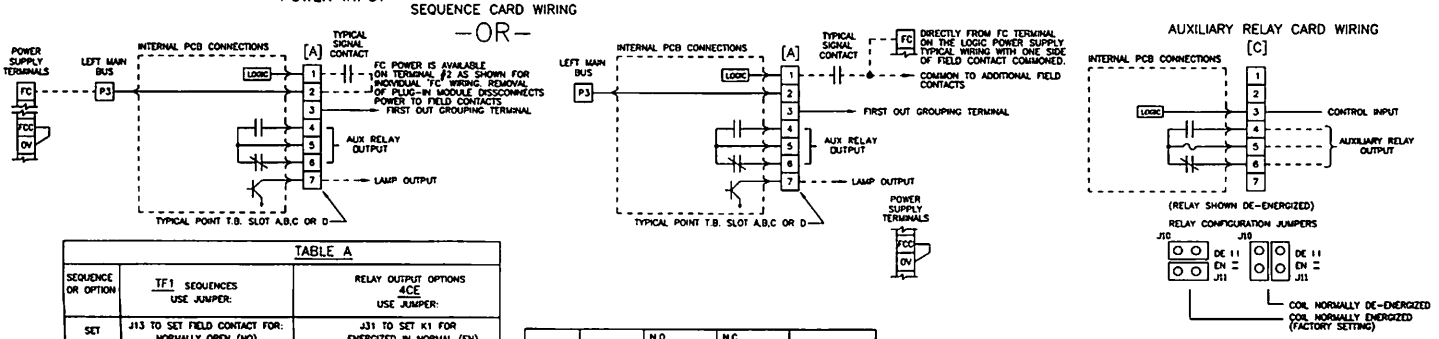


# SERIES90 Custom Wiring Diagram

At a modest price, PANALARM can provide a composite-wiring diagram, customized to the exact configuration of your Series 90 system. The diagram incorporates all components of the annunciator system including remote devices such as auxiliary relays, horns and pushbuttons. CAD, generated the wiring diagram is extremely beneficial for customer start-up, virtually eliminating field problems related to wiring confusion. This diagram will also serve as a shortcut to help customers with tying in the annunciator to their overall system drawing requirements.

Please ask your local PANALARM representative to include a "CAD" diagram with your next annunciator purchase. Depending on the size of the annunciator system the hard copy drawing will be either 11" x 17", 17" x 22" or 22" x 34". The finished diagram is also available as an electronic AutoCAD or DXF file. The electronic file must be specified at the time of ordering. A sample diagram is shown below.




| TABLE A | | |
|---|---|---|
| SEQUENCE OR OPTION | TF1 SEQUENCES USE JUMPER: | RELAY OUTPUT OPTIONS 4CE USE JUMPER: |
| SET JUMPER | J13 TO SET FIELD CONTACT FOR: NORMALLY OPEN (NO) OR NORMALLY CLOSED (NC) | J31 TO SET K1 FOR ENERGIZED IN NORMAL (EN) OR DE-ENERGIZED IN NORMAL (DE) |
| EXAMPLE OF JUMPER SETTING | SET FOR NORMALLY OPEN / SET FOR NORMALLY CLOSED | SET FOR ENERGIZED IN NORMAL / SET FOR DE-ENERGIZED IN NORMAL |

| OPTION CODE | INPUT STATUS | N.O. CONTACT STATUS | N.C. CONTACT STATUS | DESCRIPTION |
|---|---|---|---|---|
| 4CE | NORMAL | ⊣⊢ | ⊣⊢ | FOLLOWS CONTACT ONLY |
| | ALARM | ⊣⊢ | ⊣⊢ | |
| | TEST | ⊣⊢ | ⊣⊢ | |

# SERIES90 INTEGRAL Packaging/Dimensions

## Modular Flexibility

For integral logic systems, Series 90 offers a choice of modular flush mount or wall mount cabinetry. Each Annunciator cabinet is assembled using four terminal blocks per module. Each module will accommodate 1, 2, 3, or 4 logic cards.

**Model Number Explanation:**

① ② ③ ④ ⑤ ⑥

① **94** = Series 90, 4 terminal blocks per module

② **CA** = Type of cabinet (flush mount)

③ **1** to **10** = Module rows high

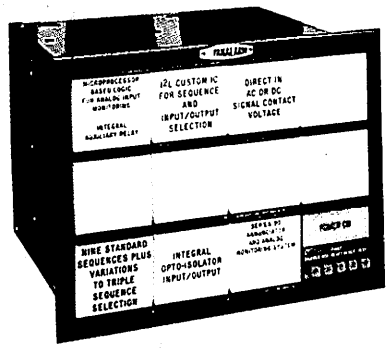
④ **2** to **10** = Module rows wide

⑤ **CF1** = One cabinet cooling fan, 120V, 50/60 Hz (Required only for cabinets with 11-25 analog input cards)
**CF2** = Two cabinet cooling fans, 120V, 50/60 Hz (Required only for cabinets with more than 25 analog input cards)

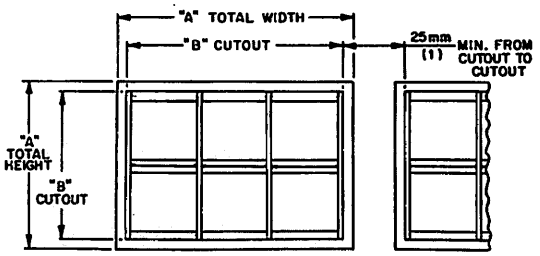
⑥ **G7** = Optional gold plated bus (card edge contact) finish
**G8** = Optional gold flashed bus (card edge contact) finish

### Module 94CA Flush Mount Cabinets

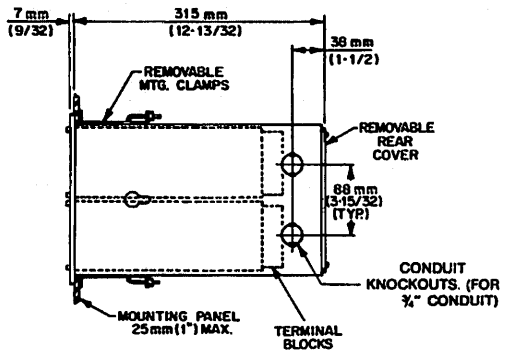
Suitable for any number of modules from 1 H by 2 W to 10 H by 10 W. Lamps accessible by removing snap-off window nameplates. Plug-in alarm cards accessible by removing pull-out lightbox assemblies. Refer to pages 12 & 13 for lightbox information.




FRONT VIEW



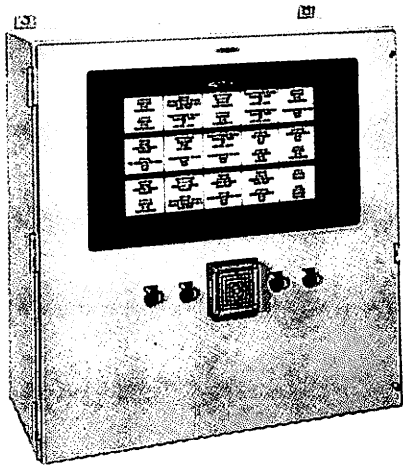

SIDE VIEW

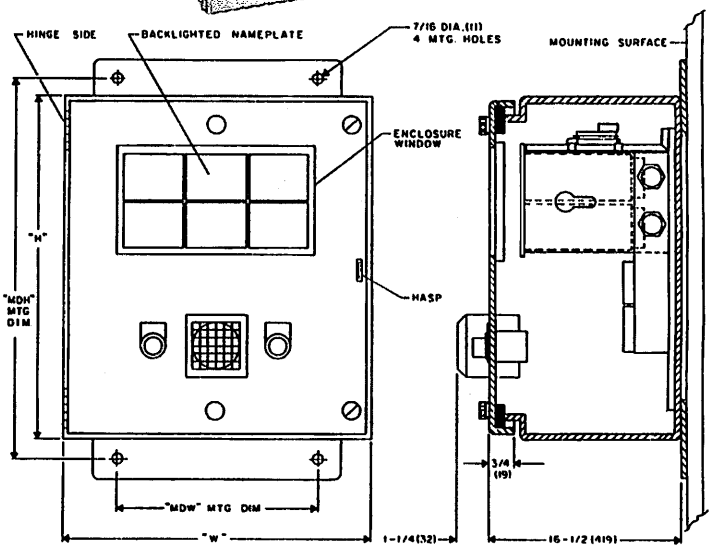



| CABINET SIZE | | "A" DIMENSION | "B" +1/32 -0 DIMENSION |
|---|---|---|---|
| MODULE ROWS HIGH | MODULE COLUMNS WIDE | | |
| 1 | — | 127 (5) | 103 (4-1/16) |
| 2 | 2 | 215 (8-15/32) | 191 (7-17/32) |
| 3 | 3 | 303 (11-15/16) | 279 (11) |
| 4 | 4 | 391 (15-13/32) | 368 (14-15/32) |
| 5 | 5 | 479 (18-7/8) | 456 (17-15/16) |
| 6 | 6 | 568 (22-11/32) | 544 (21-13/32) |
| 7 | 7 | 656 (25-13/16) | 632 (24-7/8) |
| 8 | 8 | 744 (29-9/32) | 720 (28-11/32) |
| 9 | 9 | 832 (32-3/4) | 808 (31-13/16) |
| 10 | 10 | 920 (36-7/32) | 896 (35-9/32) |

### NEMA 4 or 12 Surface Mount Cabinets

94CA cabinets are available mounted and wired in surface mount enclosures.
Enclosures for cabinets up to 5 high by 8 wide are available in either NEMA 4 or NEMA 12 versions. Larger enclosures, NEMA 12 only.
To order a 94CA57 in an enclosure, for example, specify a type C5, NEMA 4 (or NEMA 12) surface mount cabinet.
Door mounted pushbuttons and audible devices are optional.





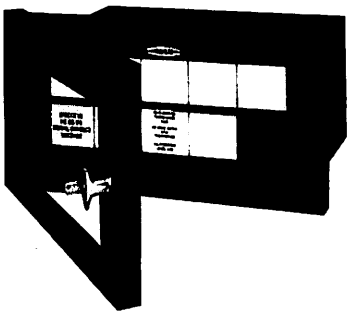

FRONT VIEW — SIDE VIEW SECTION

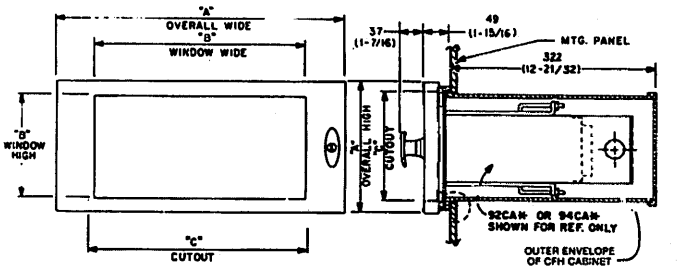
| TYPE | ROWS WIDE | DIMENSIONS | |
|---|---|---|---|
| | | "W" | "MDW" |
| A | 3 OR 4 | 24-3/4(629) | 20-3/4(527) |
| B | 5 OR 6 | 32-1/2(826) | 28-1/2(724) |
| C | 7 OR 8 | 40-1/4(1022) | 36-1/4(921) |

| TYPE | ROWS HIGH | DIMENSIONS | |
|---|---|---|---|
| | | "H" | "MDH" |
| 1 | 1 | 18(457) | 19-1/2(495) |
| 3 | 2 OR 3 | 34(864) | 35-1/2(902) |
| 5 | 4 OR 5 | 50(1270) | 51-1/2(1308) |
| 7 | 6 OR 7 | 65(1651) | 66-1/2(1689) |

## Model 90DH (Illustrated) or 90DT Special Purpose Doors

Gasketed to seal off front of annunciator from front of panel environment. Suitable for use in applications where entire panels are purged. Available with handle (DH), or thumbscrews (DT). DT doors up to 5 high x 7 wide are available with NEMA 4 Rating.



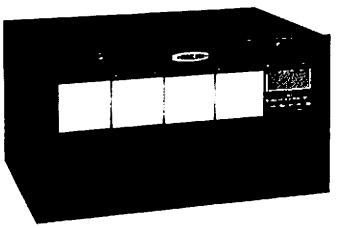


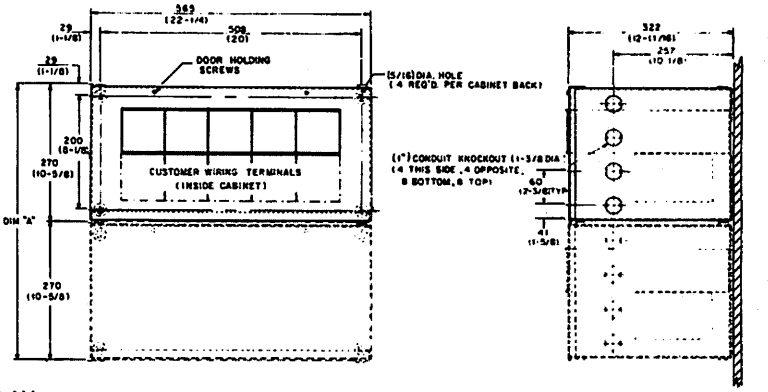

| Cabinet Position | | DH, DT, CF_ | DH, DT, CF_ | CF_ | DH, DT |
|---|---|---|---|---|---|
| Module Rows High | Module Rows Wide | "A" Dimension Overall | "B" Dimension Window | "C" Dimension Cutout | "C" +1/32 -0 Dimension Cutout |
| 1 | — | 229 (9) | 102 (4) | 176 (6-15/16) | 103 (4-1/16) |
| 2 | 2 | 317 (12-15/32) | 190 (7-15/32) | 264 (10-13/32) | 191 (7-17/32) |
| 3 | 3 | 405 (15-15/16) | 278 (10-15/16) | 352 (13-7/8) | 279 (11) |
| 4 | 4 | 493 (19-13/32) | 366 (14-13/32) | 441 (17-11/32) | 368 (14-15/32) |
| 5 | 5 | 581 (22-7/8) | 454 (17-7/8) | 529 (20-13/16) | 456 (17-15/16) |
| 6 | 6 | 669 (26-11/32) | 542 (21-11/32) | 617 (24-9/32) | 544 (21-13/32) |
| 7 | 7 | 757 (29-13/16) | 630 (24-13/16) | 705 (27-3/4) | 632 (24-7/8) |
| 8 | 8 | 845 (33-9/32) | 718 (28-9/32) | 793 (31-7/32) | 720 (28-11/32) |
| 9 | 9 | 933 (36-3/4) | 806 (31-3/4) | 881 (34-11/16) | 808 (31-13/16) |
| 10 | 10 | 1021 (40-7/32) | 895 (35-7/32) | 969 (38-5/32) | 896 (35-9/32) |

## Model 90CF_ Special Purpose Cabinets

Totally enclosed non-ventilated (TENV) cabinet suitable for air purging. 90CFH with locking "T"-handle (illustrated) or 90CFT with thumbscrews.

## Model 94WMA5 Wall Mount Cabinets

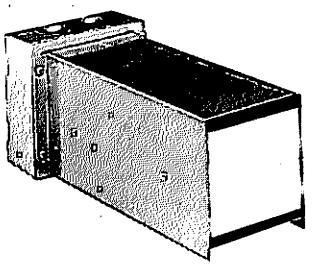


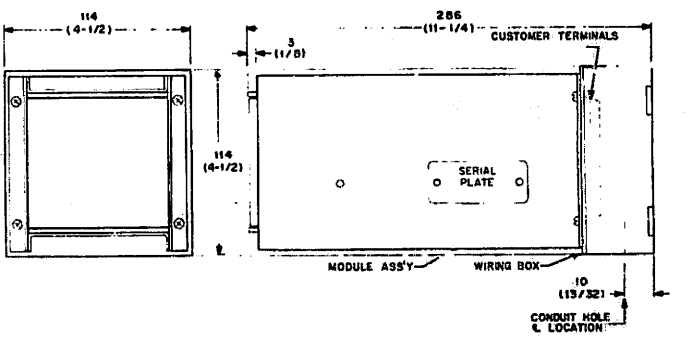



Each wall mount unit provides 5 modules, 1 H x 5 W. Four terminal blocks per module wired from front. Model 94WMR5 for remote logic has same dimensions, except no lightboxes.

| Rows High | Dim. "A" |
|---|---|
| 1 | 270 (10⅝) |
| 2 | 540 (21¼) |
| 3 | 810 (31⅞) |
| 4 | 1080 (42½) |

## Model 90WM1* Wall Mount Single Modules






Individual wall mount units with 3 terminal blocks plus 2 main bus terminal blocks accessible by separating module assembly from wiring box. Typically used for remote mounting of flasher cards and power supplies (90P1 or 90P3 ).

# SERIES90 REMOTE Packaging/Dimensions

## Remote Logic

For remote logic applications, Series 90 is available in a variety of rear or front access rack chassis, with or without integral power supply, and with terminal blocks or cable connectors. Additionally, as described on Pg. 8 a wall mount remote logic cabinet is available as Model 94WMR5. If cable connectors are not specified, all Series 90 remote equipment provides 4 terminal blocks per logic module.

### Model No. Explanation for Remote Logic Chassis

94RM ___ ③ ④

SERIES 90 REMOTE LOGIC RACK MOUNT CHASSIS

CHASSIS STYLE VARIATION CODE
01 = 5 MODULES WIDE, REAR ACCESS TERMINALS
02 = 5 MODULES WIDE, REAR ACCESS TERMINALS, WITH LIGHTBOXES (9"LA")
03 = 5 MODULES WIDE, FRONT ACCESS TERMINALS
04 = 5 MODULES WIDE, FRONT ACCESS TERMINALS, WITH LIGHTBOXES (9"LA")

94RC ___ ③ ④

SERIES 90 REMOTE LOGIC WALL MOUNT CHASSIS

CHASSIS STYLE VARIATION CODE
02 = 2 MODULES WIDE, FRONT ACCESS TERMINALS
03 = 3 MODULES WIDE, FRONT ACCESS TERMINALS
04 = 4 MODULES WIDE, FRONT ACCESS TERMINALS
05 = 5 MODULES WIDE, FRONT ACCESS TERMINALS

94RR ___ ③ ④

SERIES 90 REMOTE LOGIC CHASSIS, RS422, RACK MOUNT

CHASSIS STYLE VARIATION CODE
01 = 5 MODULES WIDE, REAR ACCESS TERMINALS
02 = 5 MODULES WIDE, REAR ACCESS TERMINALS, W/METER DISPLAY

94RW ___ ③ ④

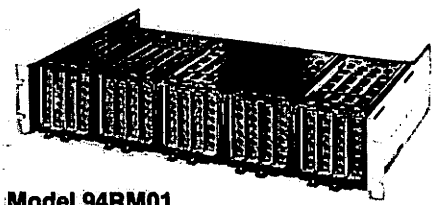
SERIES 90 REMOTE LOGIC CHASSIS, RS422, WALL MOUNT

CHASSIS STYLE VARIATION CODE
01 = 5 MODULES WIDE, FRONT ACCESS TERMINALS
02 = 5 MODULES WIDE, FRONT ACCESS TERMINALS, W/METER DISPLAY
03 = 5 MODULES WIDE, FRONT ACCESS TERMINALS, W/CONNECTORS
04 = 5 MODULES WIDE, FRONT ACCESS TERMINALS, W/METER DISPLAY AND CONNECTORS

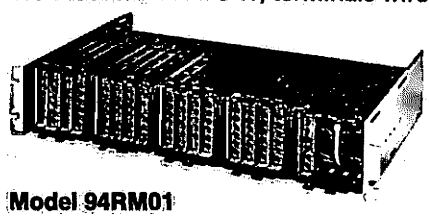
③ CONNECTOR AND WIRING OPTION VARIATION CODE (OPTIONAL)
LXX**** = CONNECTOR(S) FOR LAMPS
LFX**** = CONNECTOR(S) FOR LAMPS AND SIGNALS
LFA**** = CONNECTOR(S) FOR LAMPS, SIGNALS, AND AUX.
XFX**** = CONNECTOR(S) FOR SIGNALS
XFA**** = CONNECTOR(S) FOR SIGNALS AND AUX.
LXA**** = CONNECTOR(S) FOR LAMPS AND AUX.
XXA**** = CONNECTOR(S) FOR AUX.
└ WIRING OPTIONS (4 DIGITS, SEQUENTIAL, NON-SIGNIFICANT)

④ BUS (CARD EDGE CONTACT) FINISH OPTION
(BLANK FIELD INDICATES STANDARD TIN PLATING)
G7 = GOLD PLATE PER ENG-151-10A
G8 = GOLD FLASH PER ENG-151-10A

## Rear Access 19" Rack Mount Remote Logic Chassis

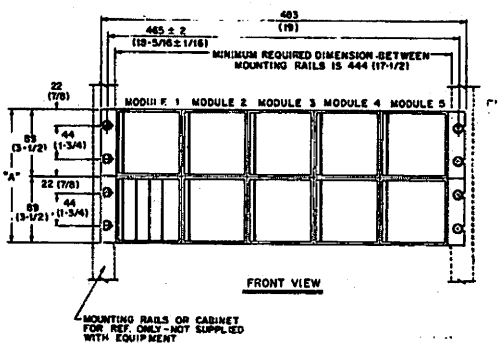


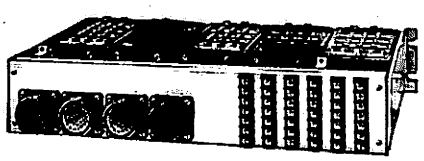
**Model 94RM01**
Five modules 1 H x 5 W, terminals wired from rear.



**Model 94RM01**
Front view with integral power supply.

**Model 94RM01** Rear View



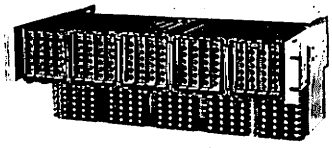



**Model 94RM01LFX****** Five modules, rear access cable connectors for lamps and signals.

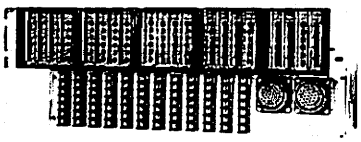
| Rows High | Dim. "A" |
|---|---|
| 1 | 89 (3½) |
| 2 | 178 (7) |
| 3 | 267 (10½) |
| 4 | 356 (14) |
| 5 | 445 (17½) |
| 6 | 534 (21) |
| 7 | 623 (24½) |
| 8 | 712 (28) |
| 9 | 801 (31½) |
| 10 | 890 (35) |
| 11 | 979 (38½) |

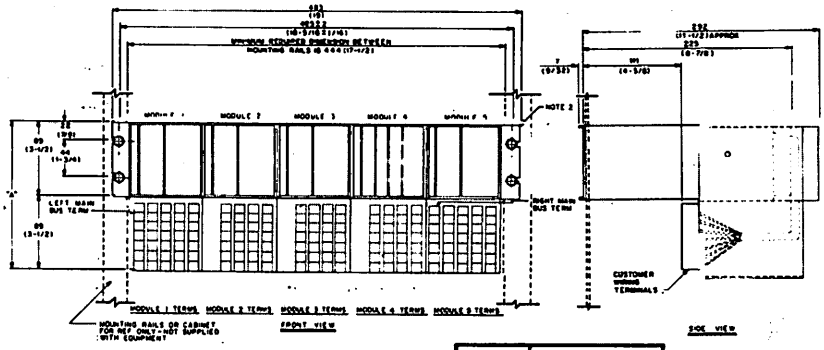
# SERIES90 REMOTE Packaging/Dimensions

## Front Access 19" Rack Mount Logic Chassis



**Model 94RM03**—Five modules, 1 H x 5 W, terminals wired from front.

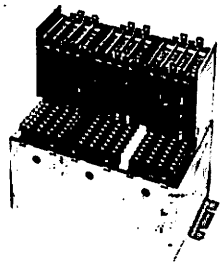




**Model 94RM03LXX******—Without integral power supply. Five modules 1 H x 5 W, front access cable connectors for lamps. When cable connectors are specified, a connector plate replaces terminal block. Mounting dimensions are unaltered.

| Rows High | Dim. "A" |
|---|---|
| 1 | 178 (7) |
| 2 | 356 (14) |
| 3 | 534 (21) |
| 4 | 712 (28) |
| 5 | 890 (35) |

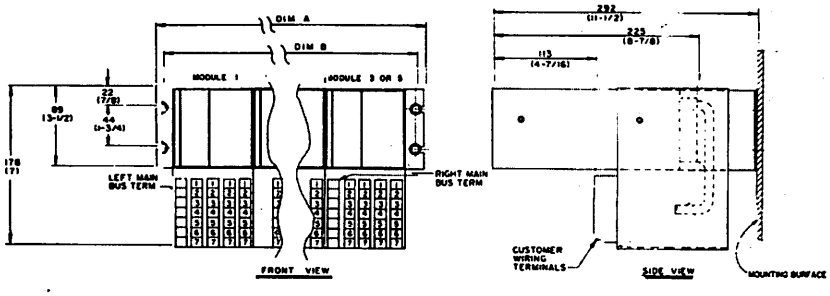
## Front Access Wall Mount Logic Chassis



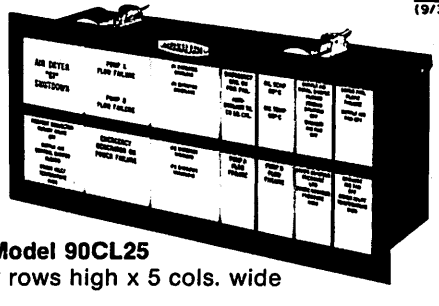
**Model 94RC03**
Provides 3 modules. 2, 4 or 5 modules wide available as Model 94RC02, 04 or 05.

| MODULES WIDE | DIM. 'A' | DIM. 'B' |
|---|---|---|
| 2 | 8.50 (216) | 7.813 ± .063 (198 ± 2) |
| 3 | 12.00 (305) | 11.313 ± .063 (287 ± 2) |

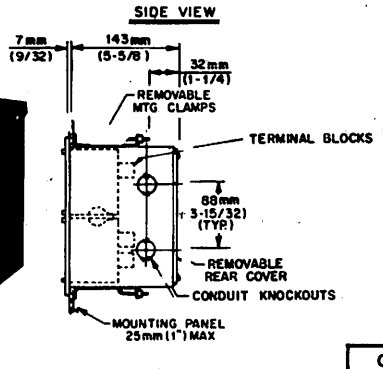
| MODULES WIDE | DIM. 'A' | DIM. 'B' |
|---|---|---|
| 4 | 15.50 (394) | 14.813 ± .063 (376 ± 2) |
| 5 | 19.00 (483) | 18.313 ± .063 (465 ± 2) |

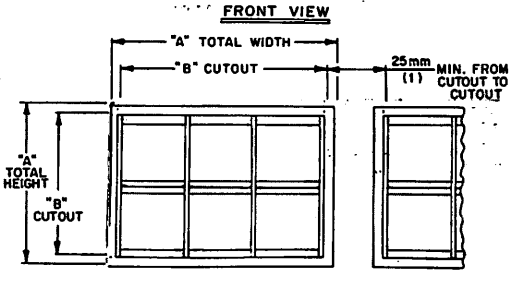



## Lamp Cabinets for Indication



**Model 90CL25**
2 rows high x 5 cols. wide




**Model 90CL** - For indication from remote logic. Suitable for any number of modules from 1 H x 2 W to 10 H x 10 W. When ordering add suffixes for module rows high and module columns wide, in that order. For example, illustration is Model 90CL25 (2 high x 5 wide).

Terminal blocks are wired from rear. Model 90CLP lamp cabinets provide rear access cable connectors in lieu of wiring terminals. (See Step 4 "To Order REMOTE...", Pg. 43.) Lightboxes with the appropriate window divisions are added to complete the lamp cabinet. (Pages 12 & 13.)

| Cabinet Position | | | |
|---|---|---|---|
| Module Rows High | Module Columns Wide | "A" Dimension | "B" +1/32 -0 Dimension |
| 1 | — | 127 (5) | 103 (4-1/16) |
| 2 | 2 | 215 (8-15/32) | 191 (7-17/32) |
| 3 | 3 | 303 (11-15/16) | 279 (11) |
| 4 | 4 | 391 (15-13/32) | 368 (14-15/32) |
| 5 | 5 | 479 (18-7/8) | 456 (17-15/16) |
| 6 | 6 | 568 (22-11/32) | 544 (21-13/32) |
| 7 | 7 | 656 (25-13/16) | 632 (24-7/8) |
| 8 | 8 | 744 (29-9/32) | 720 (28-11/32) |
| 9 | 9 | 832 (32-3/4) | 808 (31-13/16) |
| 10 | 10 | 920 (36-7/32) | 896 (35-9/32) |

# SERIES90 Lightboxes & Nameplates

Series 90 nameplates are molded of translucent polycarbonate plastic and are available in single, dual, triple, quad, hex and octal configurations. In addition to offering a choice of colored nameplates, colored filters are available for snapping behind white nameplates as an alternate method of color coding.

**Lightbox and Nameplate Ordering Explanation:**

### Annunciator Lightboxes

9 LA

**Pullout Bezel Color**
Blank field here = Standard black
WH = White RD = Red
YL = Yellow
BL = Blue BR = Brown
**Special Bus Option** (Omit if not required)
G7 = Optional gold plated bus (card edge contact) finish
G8 = Optional gold flashed bus (card edge contact) finish
**Variation Code**
01 — Standard
02, 03, etc. = Special
**Annunciator Lightbox**
**Nameplate Configuration**
1 = Single 4 = Quad
2 = Dual 6 = Hex
3 = Triple 8 = Octal

### Nameplates

9 NP

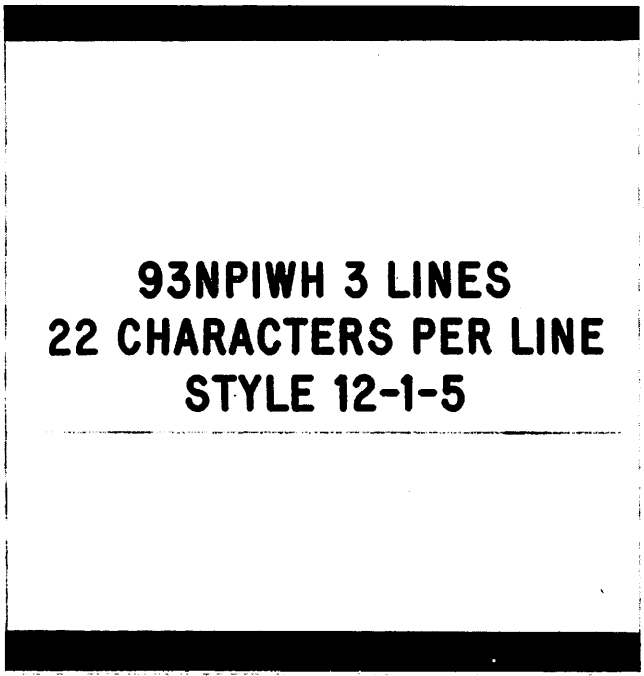
**Optional Color Film**
Use with standard white Nameplates only
1 = Green 4 = Yellow
2 = Blue 5 = Orange
3 = Red
**Nameplate Color**
WH = White BK = Black (91NP1, 992NP1, 93NP1, only)
GN = Green RT = Red, Transparent (92NP1, 93NP1, 94NP1, only)
BL = Blue
RD = Red AM = Amber (92NP1, 93NP1, 94NP1, only)
YL = Yellow GT = Green, Transparent (92NP1, only)
**Variation Code**
1 = Standard
2 = Special (94NP2 = 92NP1 Divided Vertically)
**Nameplate Configuration**
1 = Single 4 = Quad
2 = Dual 6 = Hex
3 = Triple 8 = Octal

### Lamp Cabinet Lightboxes

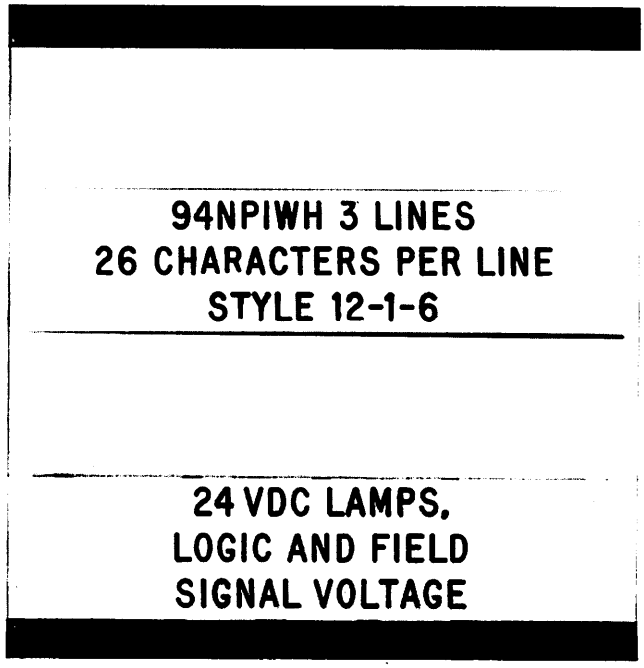
9 LBX

**Lamp Test Option** (Omit if not required)
T = With lamp test diodes
**Lamp Voltage**
D0 = No Bulbs D3 = 12 Volt
D2 = 6 Volt D4 = 24 Volt
**Variation Code**
01 — Standard
02, 03, etc. = Special
**Lamp Cabinet Lightbox**
**Nameplate Configuration**
1 = Single 4 = Quad
2 = Dual 6 = Hex
3 = Triple 8 = Octal

Colored lightbox pullout bezels may be used to color code entire module positions. Standard black bezels are shown in the accompanying illustrations.

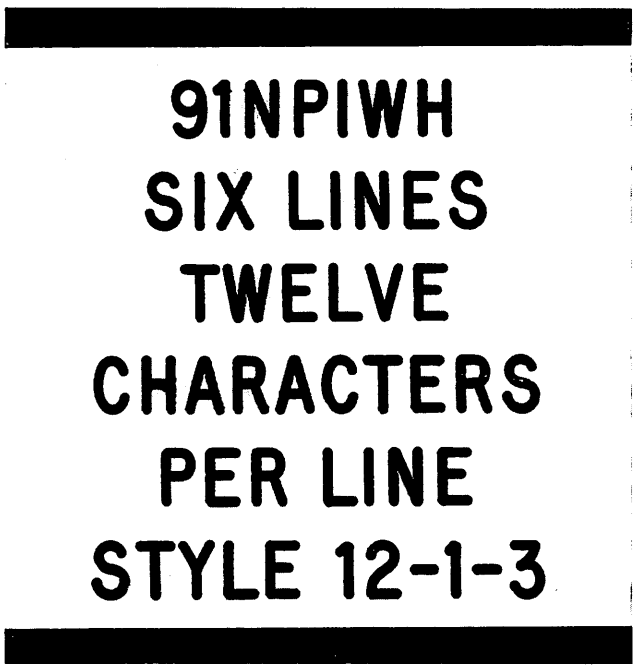



Model 93LA01 or 93LBX01 [6W] (93LBX02 [6W] for use with two color sequences)
Triple (3 nameplates), 24mm x 84mm (15/16" H x 3 5/16" W)***
Character Style No. 12-1-5

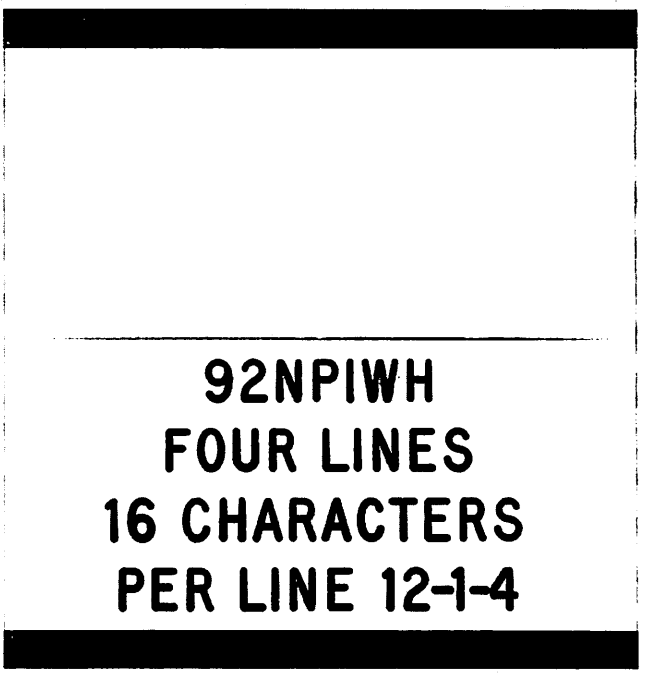



Model 94LA01 or 94LBX01 [8W] (94LBX02 [8W] for use with two color sequences, 94LA03 for use with twinpoint cards)
Quad (4 nameplates), 18mm x 84mm (11/16" H x 3 5/16" W)***
Character Style No. 12-1-6

# SERIES90 Lightboxes & Nameplates

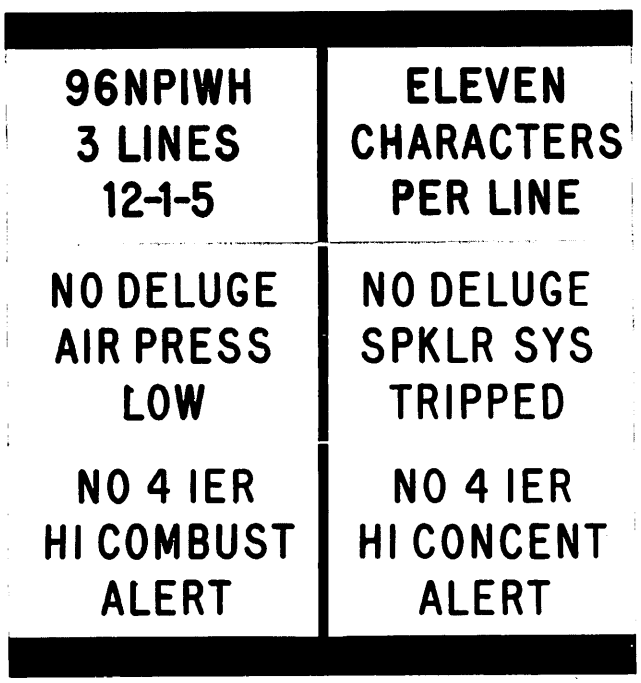



Model 91LA01 or 91LBX01 [4W] (91LA02 or 91LBX02 [4W] for use with two color sequences)
Single (1 nameplate), 76mm x 84mm (3" H x 3 5/16" W)***
Character Style No. 12-1-3

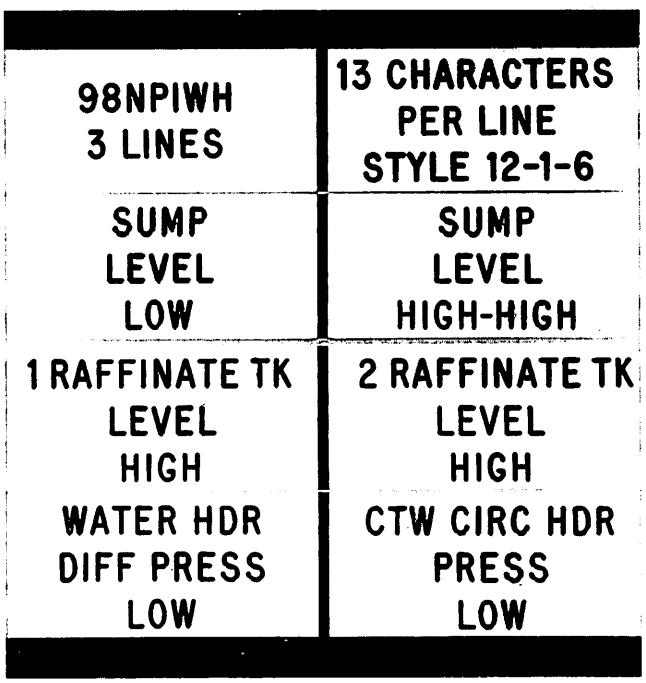



Model 92LA01 or 92LBX01 [4W] (92LA02 or 92LBX02 [4W] for use with two color sequences, 92LA03 for use with twinpoint cards)
Dual (2 nameplates), 37mm x 84mm (1 7/16" H x 3 5/16" W)***
Character Style No. 12-1-4

**Lightboxes with Nameplates Shown Actual Size**




Model 96LA03 or 96LBX01 [6W]
Hex (3 double nameplates), 24mm x 41mm (15/16" H x 1 5/8" W)*** Character Style No. 12-1-5




Model 98LA03 or 98LBX01 [8W]
Octal (4 double nameplates), 18mm x 41mm (11/16" H x 1 5/8" W)*** Character Style No. 12-1-6

***Nameplates size per **individual window.**

# SERIES90 Operational Sequences

**Refer to pages 20-23 for additional sequences**

Nine standard operational sequences are offered which satisfy the majority of application requirements. Additional sequences and variations are available to satisfy unique requirements. Series 90 offers over 35 sequence variations without modification to the internal chassis wiring and includes but is not limited to ISA Standard Sequences. This means versatility when ordering or even after installation. Consult the PANALARM representative in your area or call us direct if you desire a sequence variation not shown in the catalog.

Note: Test is full functional for all sequences. Lamp test is optional. The 90F1X1PB Flasher is used with all sequences. For systems exceeding 300 points, a slave flasher Model 90F2X must be added to the system for synchronized flashing rates. Dim on normal in lieu of lamp test is a Flasher and Sequence card option. (Specify 1LT on point cards and 1DN on flasher.)

## AF (AF1)

I.S.A. SEQUENCE "A" (LOCK-IN) AND "A-4" (NON LOCK-IN)

| Basic Flashing | Test or Alert | Acknowledge | Return to Normal |
|---|---|---|---|
| Visual | Flashing | Steady On | Off |
| Audible | On | Off | Off |

1. Non-lock-in Option returns Alert condition to normal without operator Acknowledge if input signal returns to normal.
2. Pushbuttons: (2), Acknowledge and Test.
3. Standard plug-in card for trouble contact input: 91AF1T24DC or 92AF1NL24DC (twinpoint).

## FR (AF2)

I.S.A. SEQUENCE "A-1-2"

| Basic Flashing, Separate Flasher Reset | Test or Alert | Acknowledge | Flash Reset | Return to Normal |
|---|---|---|---|---|
| Visual | Flashing | Flashing | Steady On | Off |
| Audible | On | Off | Off | Off |

1. Pushbuttons: (3), Acknowledge, Flash Reset, and Test.
2. Standard plug-in card for trouble contact input: 91AF2T24DC or 92AF2NL24DC (twinpoint).

## AM (AF3)

I.S.A. SEQUENCE "M"

| Basic Flashing, Manual Reset | Test or Alert | Acknowledge | Return to Normal | Reset to Normal |
|---|---|---|---|---|
| Visual | Flashing | Steady On | Steady On | Off |
| Audible | On | Off | Off | Off |

1. Pushbuttons: (3), Acknowledge, Reset, and Test.
2. Standard plug-in card for trouble contact input: 91AF3T24DC or 92AF3NL24DC (twinpoint).

## FRM (AF4)

I.S.A. SEQUENCE "M-1-2"

| Basic Flashing, Separate Flasher Reset and Manual Reset | Test or Alert | Acknowledge | Flash Reset | Return to Normal | Reset to Normal |
|---|---|---|---|---|---|
| Visual | Flashing | Flashing | Steady On | Steady On | Off |
| Audible | On | Off | Off | Off | Off |

1. Pushbuttons: (4), Acknowledge, Flash Reset, Reset, and Test.
2. Standard plug-in card for trouble contact input: 91AF4T24DC or 92AF4NL24DC (twinpoint).

## ARR (AR1)

I.S.A. SEQUENCE "R"

| Basic Flashing With Return Slow Flash and Return Audible | Test or Alert | Acknowledge | Return to Normal | Reset to Normal |
|---|---|---|---|---|
| Visual | Flashing | Steady On | Slow Flashing | Off |
| Audible #1 | On | Off | Off | Off |
| Audible #2 | Off | Off | On | Off |

1. Pushbuttons: (3), Acknowledge, Reset, and Test.
2. Standard plug-in card for trouble contact input: 91AR1T24DC or 92AR1NL24DC (twinpoint).
3. If only one horn is desired for both alert and return to normal, horn output terminals are connected together at flasher card terminal block.

# SERIES90 Operational Sequences

I.S.A. SEQUENCE "F3A-3"

## TFS
(TF1)
(Patent No. 3,029,421)

| Tri-Flash, First Out | Test or First Alert | Subsequent Alert | Acknowledge | First Out Reset | Return to Normal |
|---|---|---|---|---|---|
| First Out Visual | Intermittent Fast Flashing | Intermittent Fast Flashing | Slow Flashing | Steady On | Off |
| Subsequent Visual | Off | Fast Flashing | Steady On | Steady On | Off |
| Audible | On | On | Off | Off | Off |

1. Pushbuttons: (3), Acknowledge, First Reset, and Test.
2. Standard plug-in card for trouble contact input: 91TF1T24DC or 92TF1NL24DC (twinpoint).

I.S.A. SEQUENCE "F3M-3"

## TFSM
(TF3)

| Tri-Flash, First Out Manual Reset | Test or First Alert | Subsequent Alert | Acknowledge | First Out Reset | Return to Normal | Reset to Normal |
|---|---|---|---|---|---|---|
| First Out Visual | Intermittent Fast Flashing | Intermittent Fast Flashing | Slow Flashing | Steady On | Steady On | Off |
| Subsequent Visual | Off | Fast Flashing | Steady On | Steady On | Steady On | Off |
| Audible | On | On | Off | Off | Off | Off |

1. Pushbuttons: (4), Acknowledge, First Reset, Reset, and Test.
2. Standard plug-in card for trouble contact input: 91TF3T24DC or 92TF3NL24DC (twinpoint).

## VSRR
(VR1)

| Two Color First Out With Return Flashing and Audible | Test or First Alert | Subsequent Alert | Acknowledge | Return to Normal | Reset | First Out Reset | Return to Normal |
|---|---|---|---|---|---|---|---|
| First Visual (Red) | Flashing | Flashing | Steady On | Slow Flashing | Slow Flashing | * | Off |
| Subsequent Visual (White) | Off | Flashing | Steady On | Slow Flashing | Off | Slow Flashing** | Off |
| Horn 1 | On | On | Off | Off | Off | Off | Off |
| Horn 2 | Off | Off | Off | On | Off | Off | Off |

1. Pushbuttons: (4), Acknowledge, First Reset, Reset, and Test.
2. Standard plug-in card for trouble contact input: 91VR1T24DC (twinpoint cards are not available).
   *If first out reset is operated after acknowledge but prior to trouble contact returning to normal, the first out point will revert to the subsequent (white) status.
   **Requires operation of reset pushbutton to reset to normal.

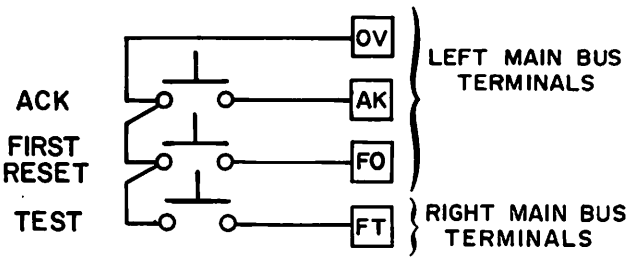
## MC
(MC1)

| Motor Control | Motor On | Test or Alert | Acknowledge | Manual Stop |
|---|---|---|---|---|
| Visual | Steady On | Fast Flashing | Slow Flashing | Off |
| Audible | Off | On | Off | Off |

1. If motor is manually stopped at any time during the sequence of operation, the visual and audible will automatically revert to the off condition. (Manual stop)
2. Pushbuttons: (2), Acknowledge and Test.
2. Standard plug-in card for trouble contact input: 91MC1T24DC or 92MC1T24DC (twinpoint).

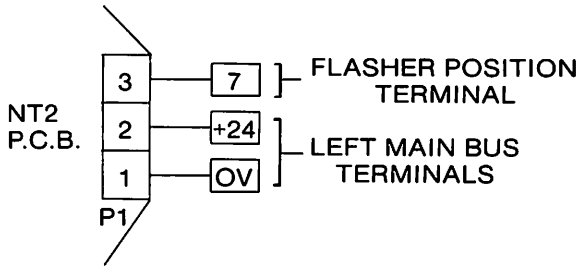
# SERIES90 Typical Wiring Diagram Sequence TFS Information

## Pushbutton Wiring Details



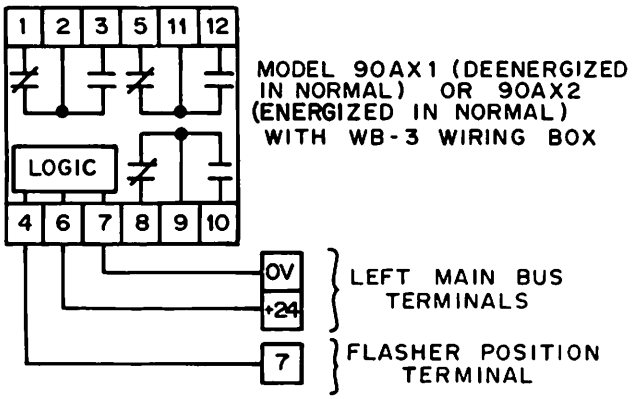

## Audible Signal Device Wiring

(1) MODEL NT2—24D NOVATONE HORN
REF DWG. #57100-48



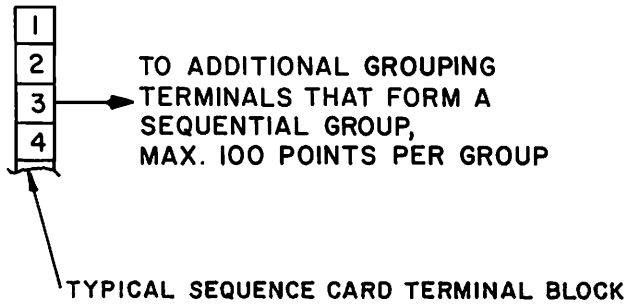

## Common Auxiliary Relay Wiring

FOR CUSTOMER USE IF REQUIRED




(3) FORM "C" CONTACTS RATED AT 5 AMPS RESISTIVE AT 28VDC OR 120 VAC & 0.5 AMP AT 125VDC.

## Terminal Grouping Diagram




## Operational Sequence TFS

| Input Status | First Visual | Subsequent Visual | Audible |
|---|---|---|---|
| 1st Alarm or Test | Interm. Fast Fl. | Off | On |
| Subsequent Alarm | Interm. Fast Fl. | Fast Flash | On |
| Acknowledge | Slow Flash | Steady-On | Off |
| First Reset | Steady-On | Steady-On | Off |
| Return to Normal | Off | Off | Off |

## TYPICAL TERMINAL AND INPUT WIRING DESIGNATIONS

**Customer Left Main Bus**
One per cabinet or remote chassis, coded White.

- P1 — Option Bus #1 Typically Used for Lamp Test or Dimmer Control Options
- FO — First Out Reset Pushbutton Connection
- AK — Acknowledge Pushbutton Connection
- P2 — Option Bus #2 Typically Used for Special Sequence Pushbutton Connection
- P3 — Option Bus #3 Typically Used as Field Contact Voltage Distribution Bus
- OV — System Common Connection (Connect to OV on power supply)
- +24 — System Logic and Lamp Voltage Connection (Connect to +24 on power supply)

**Customer Right Main Bus**
One per cabinet or remote chassis, coded White.

- FF — Fast Flash Oscillator Bus
- SF — Slow Flash Oscillator Bus
- FT — Functional Test Pushbutton Connection
- FR — Flasher Reset Pushbutton Connection
- MR — Manual Reset Pushbutton Connection
- SH — Ringback Horn Enable Bus
- FH — Alert Horn Enable Bus

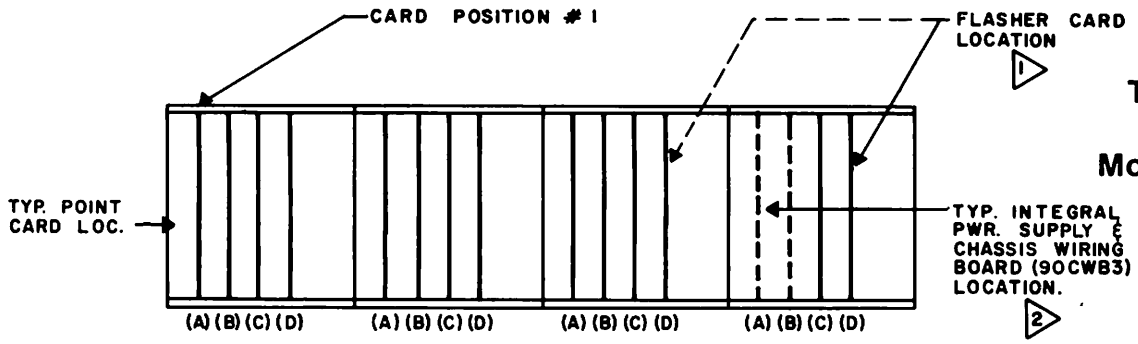
**Flasher Location**
Coded Red

- 1 — Dimmer Control Output (1DN Option Must Be Specified)
- 2, 3 — Flash Rate Inputs on 90F2X Slave Flasher only. 2 is Fast Flash Rate and 3 is Slow Flash Rate
- 4, 5 — Remote Dimmer Level Control (1DN Option Must Be Specified)
- 6 — Return Audible (NT2-24D) or Common Return Auxiliary Relay (90AX1) Connection
- 7 — Alarm Audible (NT2-24D) or Common Auxiliary Relay (90AX1) Connection

Normally Located In Lower Righthand Module Position (Front viewed)

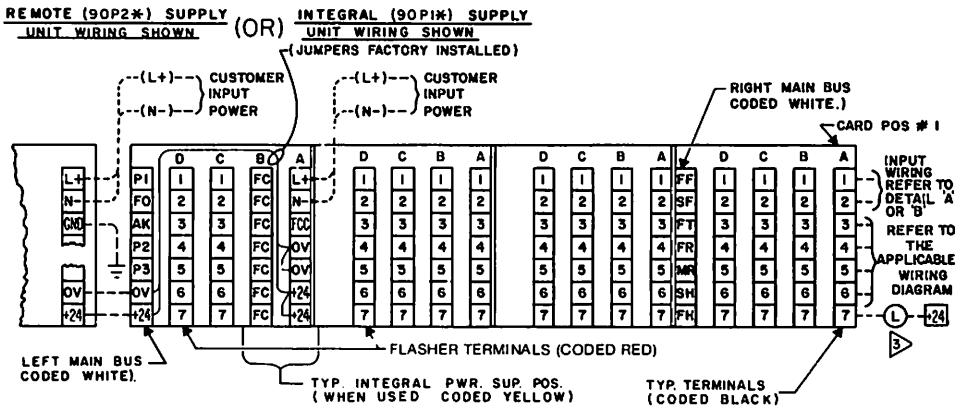
# SERIES90

## Terminal Arrangement of Model 94 Style Modules (4 Terminal Blocks Per Module) Using 1, 2, 3, OR 4 91 Cards (1 Point Per Card)

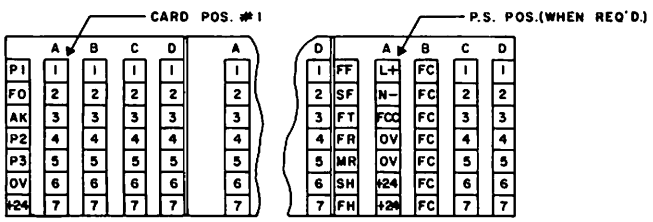



### Typical Front View, 1 H x 4 W Module Arrangement

### Typical View, Rear Terminal Arrangement




### Typical View, Front Access Terminal Arrangement



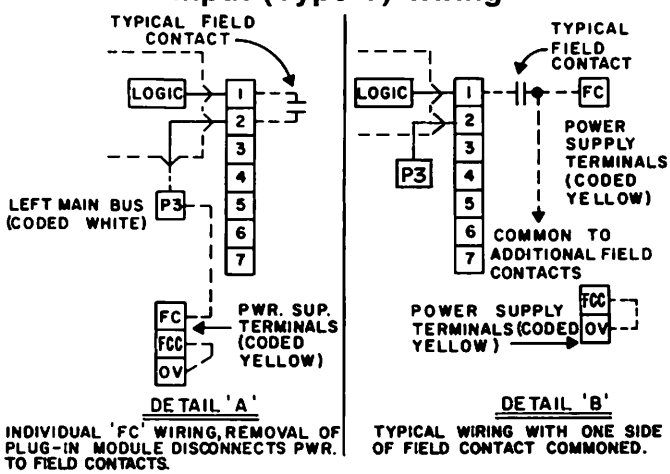

**NOTES:**

1> Flasher is normally located in the lower right module viewed from front (in systems with integral power supplies flasher is located in the module to the left of the power supply.) Flasher is wired to its module's left side terminal block (D). Capacity is 300 points.

2> Integral power supply & chassis wiring board (when used) is normally located in the lower right module, viewed from front (card position & terminals (C) & (D) are not available).

3> Remote lamp(s). Max load (total of combined integral and remote lamps): 320 mA at 24VDC.

### Input (Type T) Wiring




**Card Position A, B, C or D**
Typical Single Point Sequence Card (Using T Input)

1 — Input Signal
2 — Field Contact Voltage Output (Type T Input Cards)
3 — First Out Grouping (or Special Option Function)
4, 5 — Output Option Wiring
6, 7 — Lamp Output (Remote Logic) or Special Option Function (Integral Logic) Slave Lamp Output (Integral Logic)

**Card Position A, B, C or D**
Typical Twinpoint Sequence Card (Using NL Input)

1 — Input Signal Point #1 (Upper Nameplate)
2 — Input Signal Point #2 (Lower Nameplate)
3 — First Out Grouping (or Special Option Function)
4, 5 — Output Option Wiring
6 — Lamp Output Point #2 (Remote Logic)
7 — Lamp Output Point #1 (Remote Logic) or Special Option Function (Integral Logic)

**Integral Power Supply**

| Card Position B | Card Position A | |
|---|---|---|
| FC | L(+) | Customer's Primary Input Voltage |
| FC | N(-) | Common Side of Field Contact Voltage (for T or NL Input Type Connect FCC to OV) |
| FC | FCC | |
| FC | OV | Logic and Lamp System Common Connects to OV (External Wire) on Left Main Bus |
| FC | OV | |
| FC | +24 | Logic and Lamp Power Connect to +24 (External Wire) on Left Main Bus |
| FC | +24 | |

Field Contact Supply Voltage

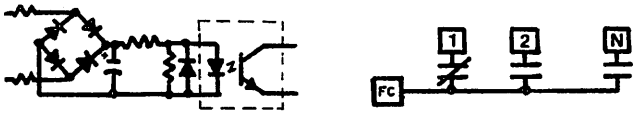
# SERIES90 Sequence Card "On Board" Options

The options on these two pages are part of the Series 90 standard systems design and may be added to sequence cards as required. Multiple options are available on one card. All options described are available for both single and twinpoint cards, unless otherwise stated. Options are ordered by adding option code designations to the end of the standard sequence card model number. Check terminal requirements for mul-

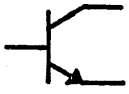
## INPUT OPTIONS

**Input Signal Configuration—Option Code KN or NL**

The standard T input will satisfy dry contact inputs for single point cards. However, other input configurations (KN or NL) are available. KN—optical isolated input for AC or DC, specify voltage in model number. See Specifications Pg. 4 for input voltages available. NL—dry contact input (standard on twinpoint cards), uses a common return wire from field for all points. Substitute KN or NL in sequence card model number.




**Transistor Switch Inputs—Option Code *PR or *PC**



Transistors may be used as switching inputs to Series 90. It may be necessary to have a pull-up resistor (Ref. Doc. 900320, Application Guide). The pull-up resistor is mounted on sequence card. Specify Resistor Code No. for desired resistance value.

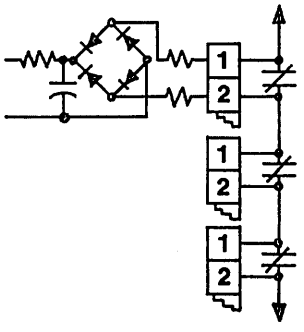
**Opto Isolator Input (with FC Interlock)—Option Code KP**

Same as option code KN except by using customer terminals 1 and 2 for signal input and option busses P1 and P2 for isolated power source input, card removal disconnects voltage from the signal wiring.

**Signal Wiring Monitor—Option Code TWM**


For single point cards only. An open circuit in the signal contact wiring loop will cause the sequence card to alarm. After acknowledge, the lamp display will blink (a 100 ms flash) at two second intervals. An end-of-line resistor (shipped loose with each card) must be field installed across each signal contact.

**Series Contact Monitor—Option Code KNA**




With this option on a first-out sequence card, up to nine series contacts in a 120 VAC control loop can be monitored. The first contact to open will initiate the first-out alarm.

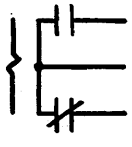
## OUTPUT OPTIONS

### Auxiliary Output Operation Modes

(For Integral Aux Contacts, Optical Couplers and Electronic Outputs, replace asterisk in option code with the selected mode number.)

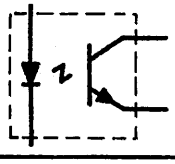
| Specify Mode Number | Operation Mode |
|---|---|
| 1 | Contact follower, operates on test. |
| 3 | Lamp output follower, provides steady signal when lamp is on or flashing, operates on test. |
| 4 | Contact follower, *does not* operate on test. |
| 5 | Lamp output follower, provides steady signal when lamp is on or flashing, *does not* operate on test. |
| 6 | Horn output follower, on only when horn is active. |
| 7 | Lamp output follower, follows flashing or on. Operates on test. |

**Integral Auxilliary Contacts—Option Codes *AE, *BE, or *CE**



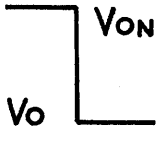
Available for a variety of operating modes. Develop Option Code by selecting mode number (1 or 3 thru 7) from Auxiliary Output Operation Modes Table and letter designation (AE, BE, or CE) for contact configuration: AE—normally open, SPST; BE—normally closed, SPST; CE—single pole double throw. Energized or deenergized in normal is field selectable. (Available on twinpoint cards when used with analog input or option 9A for NL inputs.)

**Optical Couplers—Option Codes *KT, *KC, or *KE**



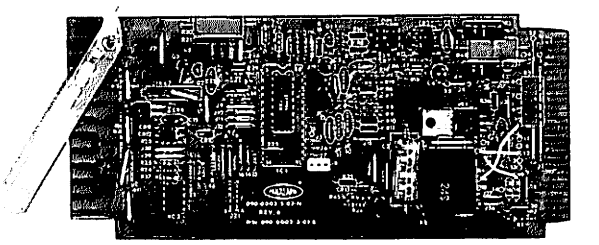
Isolated transistor switch output for connection to customer instrumentation and associated voltage. Transistor rating 30VDC; 10mA max. Saturation Voltage 0.3VDC @ 5mA. Develop Option Code by selecting mode number (1 or 3 thru 7) from Auxiliary Output Operation Modes Table and letter designation (KT, KC, or KE) for optical coupler wiring; KT—Collector and emitter wired out; KC—collector pull-up resistor (2.2K ohm), collector and emitter wired out; KE—collector, emitter, and emitter resistor (2.2K ohm) wired out. Energized or deenergized in normal is field selectable.

**Electronic Outputs—Option Codes *EA thru *EH, *EJ thru *EM**




Open collector (NPN) output to drive remote auxiliary relay (90AX1 or 90AX2). Transistor rating is 18VDC; 10mA max. Saturation Voltage 2.0VDC @ 10mA. Emitter is connected to system common (OV). May be grouped to achieve common function. Develop Option Code by selecting mode number (1 or 3 thru 7) from Auxiliary Output Operation Modes Table and letter designation for wiring desired.

tiple option usage. Refer to the "SEQUENCE CARD MODULE NUMBER STRUCTURE" section on pages 20-23.



## MISCELLANEOUS OPTIONS

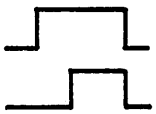
**Twinpoint Card FC Interlock—Option Codes TA or TB**

With either option, card removal disconnects voltage from field wiring. Option TA requires the use of four customer terminals (two inputs and two FC'S). Option TB requires the use of three customer terminals (two inputs and one FC).

**Inputs from Analog Cards—Option Codes DM or DB**

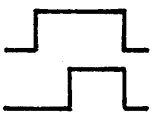
Sequence cards used in conjunction with analog input cards receive their inputs via cross-over links between adjacent sockets (A and B or C and D). Sequence cards must have input option DM12DC for meter set systems or DB12DC for blind set systems.

**Fixed Time Delay—Option Code *FTD**



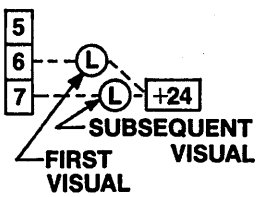
Delays point recognition of alarm after signal input change of state. Choice of time delays. If a time is not specified, standard input response is 20mS.

**Adjustable Time Delay—Option Code *ATD**



Available single point only. Identical to fixed time delay except adjustable timing spans. Specify Option Code.

**Separate Lamp Outputs—Option Code 1VT**

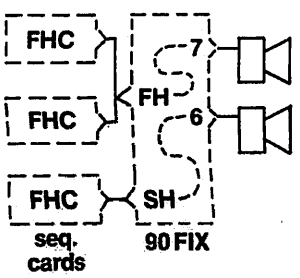



For single point, two color sequences, first out visual, (TB6), subsequent visual (TB7).

**Relay Lockout—Option Codes *RL**

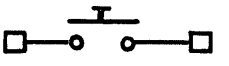
Prevents auxiliary output operation when activated. For use with auxiliary contacts and optical coupler outputs only. Wired out for lockout switch connection.

**Individual Alert Horn Enable Outputs—Option Codes *FHC**



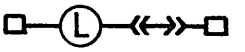

Allows alert horn enable outputs of sequence cards to be grouped to operate separate horns or output reflash (90RFR*) cards.

**Lamp Test—Option Code *LT**



Provides lamp test. 1LT can be used in addition to full functional test. Must be used when dim lamps in normal are required. (Option Code 1DN also must be specified for flasher.) 2LT provides lamp test only (no functional test).

**Card Removed Status Indicator—Option Codes *CR**



Sequence cards can be provided with a tie point which will operate a customer supplied status indicator to advise operator if a sequence card has been removed from the system.

**Individual Pushbuttons—Option Codes *PB**

This option provides pushbutton connections on customer terminals for individual sequence cards. For example, option code 1PB provides a connection to customer terminal 4 of sequence cards to allow the use of individual or grouped acknowledge pushbuttons.

**Polarizing Key—Option Codes *Y**

Certain cards may be keyed to allow insertion into only card slots for which they are wired.

**No (Lamp "Keep-Alive") Resistor—Option Code 1NR**

A standard feature of Series 90 sequence cards is a "keep-alive" resistor which allows a small amount of current through the lamp filaments when a point is not in the alarm condition. This feature increases lamp life by reducing the thermal shock effect. The 1NR option defeats this feature.

**Separate First-Out Grouping—Option Code *G**

Without this option the inhibit signal from both upper and lower points on a first-out twinpoint card are wired to one customer terminal and therefore must be in the same first-out group. With option *G, the upper point inhibit is wired to one customer terminal and the lower point inhibit to a second customer terminal.

**100 ms Power Interruption—Option Code 1M**

Available with 120 VAC input and 24 VDC "FC" power supplies, only. 1M must also appear at the end of the power supply model number. (Standard is 16ms.)

**Gold Plate—Option Codes *GF**

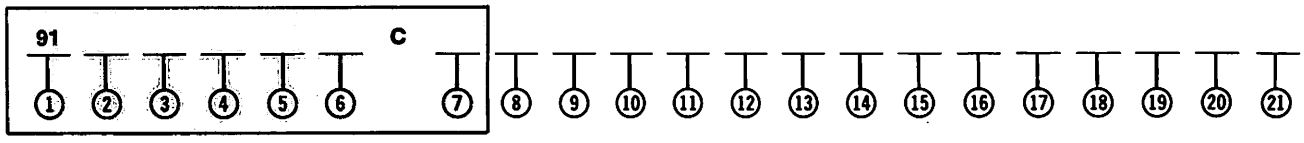
1GF; gold plated connector fingers, "chassis" end of card only. 2GF; gold plated connector fingers, both ends of card.

# SERIES90 Single Point Sequence Card Model Number Structure

When configuring a sequence card model number, the only limiting factor with regard to option compatibility (unless otherwise noted) will be the availability of customer terminals (TB1) through (TB7) and/or option busses (P1 bus) through (P3 bus).

Following each option description you will find "(TB*)" and/or "(P*)" if any of these are "used up" by that option.

It is suggested that you list TB1 through TB7 and P1, P2, P3 on a sheet of paper. As you go through the list of options you require, check off the terminals and busses used.




① Series 90 single point sequence card: 91

② Series 90 sequence designation: AF, AR, AS, LN, MC, TF, VA, VR, MP

③ Sequence variation code:
- 1 Basic sequence
- 2 Adds "Flash Reset" ("Ack" silences horn, only) to basic sequence.
- 3 Adds "Manual Reset" to basic sequence.
- 4 Adds "Flash Reset" and "Manual Reset" to basic sequence.
- 5 Non flashing sequence.
- 6 Adds "Return Ack" to ringback sequences.
- 7 Adds "Flash Reset" and "Return Ack" to ringback sequence
- 8 Deletes "First Reset" from first out sequence (automatic reset).
- 10 Same as Code 2 except lamps change from fast flash to slow flash if point returns to normal before flash reset.

**AVAILABLE ALPHA/NUMERIC COMBINATIONS**

| Series 90 Model Number | Panalarm Alpha Sequence Designation | Operational Sequence |
|---|---|---|
| AF1 | AF | See page 14 |
| AF2 | FR | See page 14 |
| AF3 | AM | See page 14 |
| AF4 | FRM | See page 14 |
| AF5 | AO | Same as AF1 except non-flashing |
| AF10 | FRA | Same as AF2 except points returning to normal before flash reset will change from fast flash to slow flash |
| AR1 | AR/ARR | See page 14 (Omit Audible #2 for AR sequence). |
| AR2 | FRR | Adds "Flash Reset" to AR1 |
| AR6 | ARRS | Adds "Return Ack" to AR1. Uses (P2 bus) |
| AR7 | FRRS | Adds "Flash Reset" and "Return Ack" to AR1 Uses (P2 bus) |
| AS1 | AS | First out point fast flash, subsequent points steady on (TB3) |
| AS3 | ASM | Adds "Manual Reset" to AS1 (TB3) |
| LN1 | LN | Status indicator (Non flashing, no horn, no ack) |
| MC1 | MC | See page 15 |
| TF1 | TFS | See page 15 (TB3) |
| TF2 | TFSFR | Adds "Flash Reset" to TF1 (TB3) |
| TF3 | TFSM | See page 15 (TB3) |
| TF4 | TFSFRM | Adds "Flash Reset" to TF3 (TB3) |
| VA1 | VS | First out flashes red, subsequents flash white. Pushbuttons: "Ack," "First Reset", "Test" (TB3). |
| VA2 | VSFR | Adds 'Flash Reset" to VA1 (TB3) |
| VA3 | VSM | Adds "Reset" to VA1 (TB3) |
| VA4 | VSFRM | Adds "Flash Reset" and "Reset" to VA1 (TB3) |
| VA5 | VO | Non flashing (Same as VA1 except first out steady red) (TB3) |
| VA8 | VSA | Same as VA1 except without "First Reset" (Automatic reset) (TB3) |
| VR1 | VSRR | See page 15 (TB3) |
| VR2 | VSFRR | Adds "Flash Reset" to VR1 (TB3) |
| VR6 | VSRRS | Adds "Return Ack" to VR1 Uses (P2 bus, TB3) |
| VR7 | VSFRRS | Adds "Flash Reset" and "Return Ack" to VR1. Uses (TB3, P2 bus) |
| MP1 | | Multiprogrammable: AF1, 2, 3, 4, TF1, 2, 3, 4. |
| MP2 | | Multiprogrammable: AF1, 2, 3, 4, TF1, 2. |

Model 91MP cards have on-board "DIP-FIX" switches to select one of the above operational sequences, N.O. or N.C. signal input and, for sequence AF, lock-in or non lock-in of momentary alarms.

④ **INPUT TYPE**
- **T** = Contact (standard, with FC voltage interlock) (TB1, TB2, P3 bus)
- **KN** = Opto-isolator (TB1, TB2)
- **KP** = Opto-isolator (with FC voltage interlock) (TB1, TB2, P1 bus, P2 bus)
- **DM** = Direct (for meter set analog 91AD).
- **DB** = Direct (for blind set analog 91AB).
- **DNL** = Accepts input from electronic outputs of other sequence cards.
- **NL** = Contact without FC interlock (TB1)
- **TWM** = Contact with wire monitor (TB1, TB2, P3 bus)
- **KNA** = Opto-isolator, series contact monitor only (TB1, TB2)

⑤ **INPUT VOLTAGE** Available with input types
- **5** = "KN", "KP"
- **12** = "T", "KN", "DM", "DB", "DNL", "NL" & "KP"
- **24** = "T", "KN", "NL", "KP" & "TWM"
- **48** = "T", "KN", "NL" & "KP"
- **125D** = "T", "KN", "NL", "KP" & "TWM"
- **120A** = "KN", "KNA" & "KP"

⑥ **VOLTAGE TYPE** Available with input type:
- **A** = AC voltage, "KN" & "KP", "KNA"
- **D** = DC voltage, "T", "KN", "DM", "DB", "DNL", "NL", "KP" & TWM"

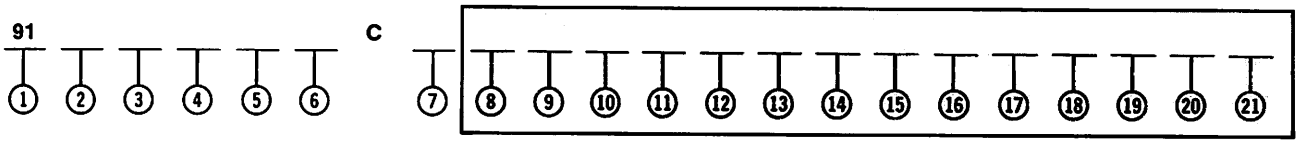
**NOTE: The shortest possible model number must contain a minimum of elements ① through ⑥.**
**Example: 91TF1T24DC**
**Elements ⑦ through ㉑ are added, as required, in the order listed. Pay particular attention to terminals and busses used.**
**Example: 91TF1KN24DC4PC4CE4RL**

⑦ **INPUT SIGNAL CONFIGURATION**
(Input pull up resistor) Maximum allowable power dissipation for card mounted resistor: 1.75 Watts

| | | | |
|---|---|---|---|
| 1PR = 100 ohm<br>2PR = 220 ohm<br>3PR = 470 ohm<br>4PR = 1K<br>5PR = 2.2K<br>6PR = 4.7K<br>7PR = 6.8K<br>8PR = 8.2K<br>9PR = 10K | between (TB1) and (TB2) | 1PC = 100 ohm<br>2PC = 220 ohm<br>3PC = 470 ohm<br>4PC = 1K<br>5PC = 2.2K<br>6PC = 4.7K<br>7PC = 6.8K<br>8PC = 8.2K<br>9PC = 10K | For "NL" type input on TB1. Resistor between (TB1) and (P3 bus) For "KN" type input on (TB1) and (TB2). Resistor between TB1 and (P3 bus) |

# SERIES90 Single Point Sequence Card Model Number Structure

Note that cards requiring the use of one of the option busses cannot be mixed with other cards requiring the use of the same option bus for a different option in the same remote chassis or in the same horizontal row in a cabinet.




**⑧ TIME DELAY OPTION**

**ADJUSTABLE TIME DELAY**

| | |
|---|---|
| 1ATD = 5 to 50 ms<br>2ATD = 20 to 500 ms | Delay on alarm, return & test. |
| 3ATD = 0.2 to 5 Sec<br>4ATD = 2 to 50 Sec<br>5ATD = 20 to 500 Sec | Alarm delay specified. Delay on return or test approximately 5ms. |

**FIXED TIME DELAY**

| | |
|---|---|
| 1FTD = 1 Sec<br>2FTD = 2 Sec<br>3FTD = 5 Sec<br>4FTD = 10 Sec<br>5FTD = 20 Sec<br>6FTD = 50 Sec<br>7FTD = 100 Sec<br>8FTD = 200 Sec<br>9FTD = 500 Sec | Alarm delay specified. Delay on return or test approximately 5ms. |
| 12FTD = 2 ms<br>13FTD = 5 ms<br>14FTD = 10 ms<br>* = 20 ms<br>16FTD = 50 ms<br>17FTD = 100 ms<br>18FTD = 200 ms<br>19FTD = 500 ms | Delay on alarm, return & test. |

*If no time delay is specified, sequence card will be standard 20ms ("FTD" option not required).

**⑨ NO PREHEAT OF LAMPS**
**1NR** No (Lamp Keep-Alive) Resistor

**⑩ POLARIZING KEY OPTION**
**1Y** = Key located in position 1 & 7 (used for seq. cards with "T" or "NL" inputs)
**2Y** = Key located in position 2 & 6 (used for seq. cards with "KP" or "KN" inputs)
**3Y** = Key located in position 3 & 5 (used for analog cards "AD" or "AB")
**4Y** = Key located in position 4 & 5 (used for seq. cards with "DM" or "DB" options)

**⑪ DISCONNECT POWER**
**NOTE:** This is not a recommended option.
**1DP** Card disable "DIP-FIX" switch mounted on card. (Disconnects +24V).
**3DP through 7DP** Card disable via remote switch connected to TB3 through TB7, respectively.

**⑫ LAMP DRIVER SHORT CIRCUIT PROTECTION**
**1LCP** = Shutdown circuit prevents damage from shorted lamp or lamp circuit.

**⑬ Auxiliary Output Operation Modes**

1 = Contact follower operates with test P.B.
3 = Steady lamp follower operates with test
4 = Contact follower no test.
5 = Steady lamp follower no test
6 = Steady horn follower with test
7 = Follows lamps flashing or steady on

**Integral Aux. Contacts**

(PLUS)

AE = Form "A" Contact (TB4 & 5)
BE = Form "B" Contact (TB5 & 6)
CE = Form "C" Contact (TB4, 5 & 6)
— Sealed Relay Contact

OR

AE = Form A
BE = Form B
CE = Form C
— Sealed Relay Contact

**Optical Couplers**

(OR)

KT = Opto-isolator emitter/collector output. (TB4 & 5)
KC = Opto-isolator with collector pull up resistor (TB4, 5 & 6)
KE = Opto-isolator with emitter resistor (TB4, 5 & 6)

**Electronic Outputs**

(OR)

EA = Electronic Output on (TB4)
EB = Electronic Output on (TB5)
EC = Electronic Output on (TB6)
ED = Electronic output on (TB7)
EJ = Electronic output on (TB3)
EL = Electronic output on internal crossover to adjacent card—used with 90AXC*
EM = Electronic output on (P2 bus) (used w/90RFR2)

**⑭ RELAY LOCKOUT OPTION**
**1RL** = (TB6)
**2RL** = (TB4)
**3RL** = (TB3)
**4RL** = (P2 bus)
**5RL** = (TB7)
**10RL** = (TB2)

**⑮ CARD REMOVED STATUS INDICATION OPTION**
**1CR** = (TB4)
**2CR** = (TB5)
**3CR** = (TB6)
**4CR** = (TB3)
**5CR** = (TB7)
**6CR** = (TB6)—Special (multiple cards)

**⑯ INDIVIDUAL ALERT HORN ENABLE OUTPUT OPTION**
**1FHC through 7FHC** = output on TB1 through TB7, respectively.

**⑰ INDIVIDUAL PUSHBUTTON FUNCTION**
**1PB** = Ack wired out to customer terminal (TB4)
**3PB** = Ack wired out to customer terminal (TB4)
Rst wired out to customer terminal (TB6)
**8PB** = Ack wired out to (TB4), test wired out to (TB5).
Other combinations are available.

**⑱ SEPARATE LAMP OUTPUTS (1GP, Only, because available with VA* or VR* Sequence only)**
**1VT** = First lamp (TB6), subsequent lamp (TB7)

**⑲ LAMP TEST OPTION (1GP, Only)**
**1LT** = Lamp test in addition to functional test (P1 bus) (1GP, only)
**2LT** = Lamp test instead of functional test (FT bus) (1GP, only)
**3LT** = Lamp test instead of functional test (P1 bus) (1GP, only)
**4LT** = Sequence card will not respond to test function
**NOTE:** When lamp dim in normal is required use 1LT option on point card and 1DN option on flasher.

**⑳ GOLD PLATE/GOLD FLASH OPTION**
**1GF** = Gold plated connector fingers
**2GF** = Gold plated connector & lightbox connector fingers
**3GF** = Gold flashed connector fingers
**4GF** = Gold flashed connector & lightbox connector fingers

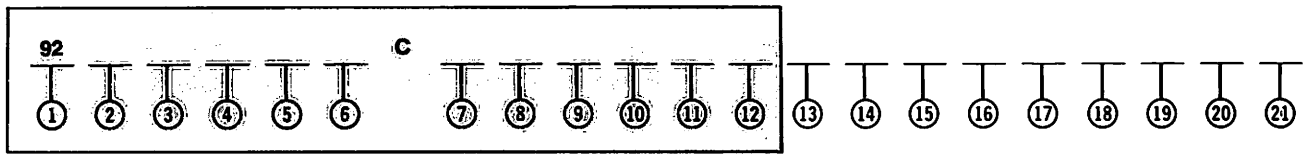
**㉑ EXTENDED POWER INTERRUPT OPTION**
**IM** = 100mS power interruption for AC input with 24VDC for 'FC' signals only.

# SERIES90 Twinpoint Sequence Card Model Number Structure

When configuring a sequence card model number, the only limiting factor with regard to option compatibility (unless otherwise noted) will be the availability of customer terminals (TB1) through (TB7) and/or option busses (P1 bus) through (P3 bus).

Following each option description you will find "(TB*)" and/or "(P*)" if any of these are "used up" by that option.

It is suggested that you list TB1 through TB7 and P1, P2, P3 on a sheet of paper. As you go through the list of options you require, check off the terminals and busses used.




(1) Series 90 twinpoint sequence card: 92

(2) Series 90 sequence designation: AF, AR, AS, LN, MC, TF, LN/AF

(3) Sequence variation code:
- 1 Basic sequence
- 2 Adds "Flash Reset" ("Ack" silences horn, only) to basic sequence.
- 3 Adds "Manual Reset" to basic sequence.
- 4 Adds "Flash Reset" and "Manual Reset" to basic sequence.
- 5 Non flashing sequence.
- 6 Adds "Return Ack" to ringback sequence.
- 7 Adds "Flash Reset" and "Return Ack" to ringback sequence

**AVAILABLE ALPHA/NUMERIC COMBINATIONS**

| Series 90 Model Number | Panalarm Alpha Sequence Designation | Operational Sequence |
|---|---|---|
| AF1 | AF | See page 14 |
| AF2 | FR | See page 14 |
| AF3 | AM | See page 14 |
| AF4 | FRM | See page 14 |
| AF5 | AO | Same as AF1 except non-flashing |
| AR1 | AR/ARR | See page 14 (Omit Audible #2 for AR sequence). |
| AR2 | FRR | Adds "Flash Reset" to AR1 |
| AR6 | ARRS | Adds "Return Ack" to AR1. Uses (P2 bus) |
| AR7 | FRRS | Adds "Flash Reset" and "Return Ack" to AR1 Uses (P2 bus) |
| AS3 | ASM | First out point fast flash, subsequent points steady on, manual reset. Uses (TB3) |
| LN1 | LN | Status indicator (Non flashing, no horn, no ack) |
| LN1/AF1 | LN/AF | Upper point LN1, lower point AF1 |
| MC1 | MC | See page 15 |
| TF1 | TFS | See page 15. Uses (TB3) |
| TF2 | TFSFR | Adds "Flash Reset" to TF1. (TB3) |
| TF3 | TFSM | See page 15. Uses (TB3) |
| TF4 | TFSFRM | Adds "Flash Reset" to TF3. (TB3) |

(4) **INPUT TYPE**
- **KN** = Opto-isolator (TB1, TB2, TB4, TB5)
- **DM** = Direct (for meter set analog).
- **DB** = Direct (for blind set analog).
- **DNL** = Accepts input from electronic outputs of other sequence cards.
- **NL** = Contact without FC interlock (Standard) (TB1, TB2)
- **TA** = Contact with FC interlock. Inputs (TB1, TB2), FC's (TB3, TB4) via (P3 bus)
- **TB** = Contact with FC interlock. Inputs (TB1, TB2), FC (TB4) via (P3 bus)

(5) **INPUT VOLTAGE** Available with input types:
- **5** = "KN", "KNP"
- **12** = "KN", "KNP", "DM", "DB", "DNL", "NL", "TA" & "TB"
- **24** = "KN", "KNP", "NL", "TA" & "TB"
- **48** = "KN", "KNP", "NL", "TA" & "TB"
- **125D** = "KN", "KNP", "NL", "TA" & "TB"
- **120A** = "KN", "KNP"

(6) **VOLTAGE TYPE**
- **A** = AC voltage available with input type "KN", "KNP"
- **D** = DC voltage available with input type "KN", "KNP", "DM", "DB", "DNL", "NL", "TA" & TB"

(7) **INPUT SIGNAL CONFIGURATION**
(Input pull up resistor) Maximum allowable power dissipation for card mounted resistor: 0.5 Watts

- **4PC or 4PR** = 1K
- **5PC or 5PR** = 2.2K
- **6PC or 6PR** = 4.7K
- **7PC or 7PR** = 6.8K
- **8PC or 8PR** = 8.2K
- **9PC or 9PR** = 10K

For "PC" type inputs, resistors between (TB1) and (P3 bus) and between (TB2) and P3 Bus. For "PR" type inputs, upper point (TB1) with resistor between TB1 and TB4, lower point (TB2) with resistor between TB2 and TB5.

(8) **TIME DELAY OPTION**
**FIXED TIME DELAY**

| | | | |
|---|---|---|---|
| **1 FTD** | = | 1 Sec | Delay on alarm, return & test |
| **2 FTD** | = | 2 Sec | |
| **3 FTD** | = | 5 Sec | |
| **12 FTD** | = | 2 ms | |
| **13 FTD** | = | 5 ms | |
| **14 FTD** | = | 10 ms | |
| * | = | 20 ms | |
| **16 FTD** | = | 50 ms | |
| **17 FTD** | = | 100 ms | |
| **18 FTD** | = | 200 ms | |
| **19 FTD** | = | 500 ms | |

*If no time delay is specified, sequence card will be standard 20ms ("FTD" option not required).

(9) **NO PREHEAT OF LAMPS**
**1NR** = No (lamp keep-alive) resistor

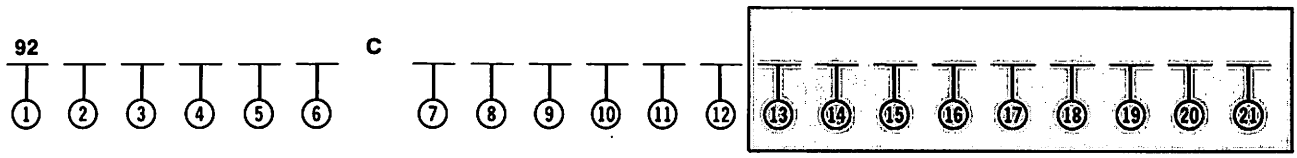
(10) **POLARIZING KEY OPTION**
- **1Y** = Key located in position 1 & 7 (used for seq. cards with "T" or "NL" inputs)
- **2Y** = Key located in position 2 & 6 (used for seq. cards with "KN" or "KP" inputs)
- **3Y** = Key located in position 3 & 5 (used for analog cards "AD" or "AB")
- **4Y** = Key located in position 4 & 5 (used for seq. cards with "DB" or "DM" options)

(11) **DISCONNECT POWER**
**NOTE:** This is not a recommended option.
- **1DP** = Card disable "DIP-FIX" switch mounted on card. (Disconnects +24V).
- **2DP through 7DP** = Card disable via remote switch connected to TB2 through TB7, respectively.

(12) **SEPARATE FIRST-OUT GROUPING TERMINAL OPTION**
- **XXG** First digit, upper point grouping terminal number. Second digit, lower point grouping terminal number.

# SERIES90 Twinpoint Sequence Card Model Number Structure

Note that cards requiring the use of one of the option busses cannot be mixed with other cards requiring the use of the same option bus for a different option in the same remote chassis or in the same horizontal row in a cabinet.




**⑬ Auxiliary Output Operation Modes**

1 = Contact follower operates with test P.B.
3 = Steady lamp follower operates with test
4 = Contact follower no test.
5 = Steady lamp follower no test
9 = Contact follower no test

**Integral Aux. Contacts**

(PLUS)

AE = Form A, BE = Form B, CE = Form C — Sealed Relay Contact

**Optical Couplers**

(OR)

KT = Opti-isolator emitter/collector output.

**Electronic Outputs**

(OR)

EE = Electronic Output (TB1 & 4)
EF = Electronic Output (TB2 & 5)
EG = Electronic Output (TB6 & 7)
EH = Electronic output (TB4 & 5)
EK = Electronic output on internal crossover to adjacent card—used with 90AXC*

1 Available on cards with "DM" or "DB" inputs only.

2 Same as option *4* except available on cards with "NL", "DM" or "DB" inputs. Form "A" or "B" cont., only. Uses (TB4 through TB7).

3 Form "AE" and form "BE" contacts use customer terminals (TB1, TB2, TB4, TB5).
Form "CE" contacts use customer terminals (TB1 through TB6).

4 "KT" uses customer terminals (TB1, TB2, TB4, TB5).

**NOTE: The shortest possible model number must contain a minimum of elements ① through ⑥.**
**Example: 92TF1NL24DC**
Elements ⑦ through ㉑ are added, as required, in the order listed. Pay particular attention to terminals and busses used.
**Example: 92AF1KN24DC6PC3FTD4EG**

**⑭ RELAY LOCKOUT OPTION**
**3RL** = (TB3)
**4RL** = (P2 bus)
**5RL** = (TB7)
**6RL** = (P1 bus)

**⑮ CARD REMOVED STATUS INDICATION OPTION**
**1CR** = (TB4)
**2CR** = (TB5)
**3CR** = (TB6)
**4CR** = (TB3)
**5CR** = (TB7)

**⑯ INDIVIDUAL ALERT HORN ENABLE OUTPUT OPTION**
**1FHC** = (TB1)
**2FHC** = (TB2)
**3FHC** = (TB3)
**4FHC** = (TB4)
**5FHC** = (TB5)
**6FHC** = (TB6)
**7FHC** = (TB7)
Both upper and lower point output on same terminal.

**⑰ INDIVIDUAL ALERT HORN DISABLE OPTION**
**1HDU** = Upper point
**1HDL** = Lower point

**⑱ ISOLATED PUSHBUTTON FUNCTIONS**
**1PB** = Ack (both points) wired out to customer terminal (TB4)
**2PB** = Ack (both points) wired out to customer terminal (TB4)
Test (both points) wired out to customer terminal (TB5).

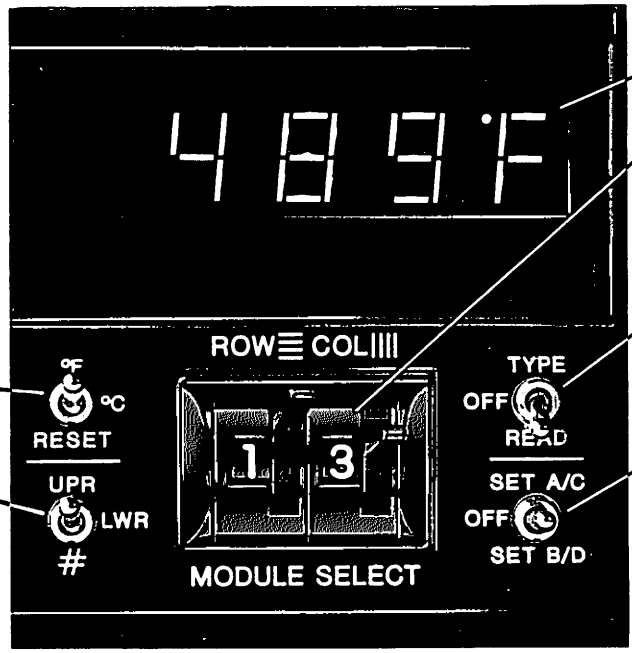
**⑲ LAMP TEST OPTION (1GP, Only)**
**1LT** = Lamp test in addition to functional test uses (P1 bus)
**2LT** = Lamp test instead of functional test uses (FT bus)

**⑳ GOLD PLATE/GOLD FLASH OPTION**
**1GF** = Gold plated connector fingers
**2GF** = Gold plated connector & lightbox connector fingers
**3GF** = Gold flashed connector fingers
**4GF** = Gold flashed connector & lightbox connector fingers

**㉑ EXTENDED POWER INTERRUPT OPTION**
**IM** = 100mS power interruption for AC input with 24VDC for 'FC' signals only.

# DIGITAL DISPLAY For Meter Set Analog (Code AD)

**MODEL 90FD***
**(Front Display Configuration)**




**Digital display**

**Window position (module) select leverwheel switches, rows (high) and columns (wide)**

**Transducer type (indiciation); center off; and read (display indication)**

**A or C setpoint switch; (center off); and B or D setpoint (dual setpoint monitor used with upper/lower/# select switch)**

**Degrees F/C select and reset switch**

**Upper/lower/# select switch (for two analog inputs in one module position) # position***

* Momentarily depressing switch to # will cause display to alternate between numerical readout and the word "tYPE" (TYPE), "FLd" (READ) "SEt A" (SET A/C) or "SEt b" (SET B/D) depending on function selected.

## General Features

The Series 90 digital display is a microprocessor-based readout unit that accepts data from microprocessor based analog input cards. The data for each analog input card can be read out on the five digit display upon address of that particular analog input point. The information displayed includes:

1. Signal input value (°C or °F or customer specified scale symbol for engineering units).
2. Setpoint values.
3. Status of each setpoint's trip direction (High, Low, High-High, High-Low, Low-Low).
4. Point status (alarm or normal) at time of reading.
5. Signal input offset compensation (for RTD's—3rd leg resistance; for thermocouples—cold junction temperature).
6. Diagnostic error signals for the display and system data communication network.
7. Type of transducer being monitored by each analog input point (curve correction used).
8. Self-test display function check and point reset.

The 90FD1 (illustrated above) display controls are all front access hand-addressed switches.

The 90FD5 frontal appearance is the same as the 90FD1 except the lower half is blank. Display control is by means of a remote 12 button touch pad keyboard. Display functions are selected by pressing one key or combinations of 2 or 3 keys. The keyboard is connected to the front display unit via a 7 conductor cable. When properly mounted on a NEMA 4 or 12 panel or enclosure, the keyboard is suitable for NEMA 4 or 12 applications.

The Series 90 digital display may also be mounted remote from the annunciator monitoring system cabinet for those applications where it is desirable to have operator controls in a desk top console.

The Series 90 digital display is capable of reading out information for a maximum of 200 inputs configured in a Series 90 integral enclosure or remote chassis arrangement.

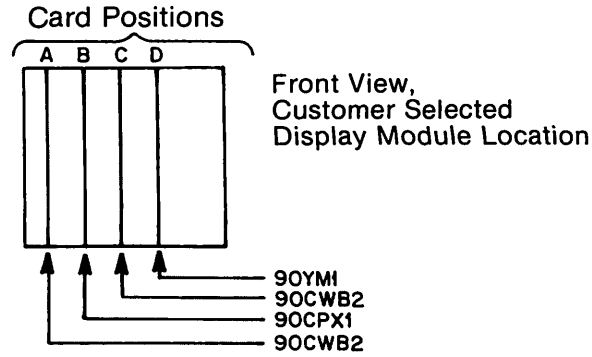
## Input Monitoring Capacity

For monitoring up to 100 inputs in a system configured in any size matrix up to, and including, 10 rows high by 5 columns wide, the digital display will occupy any one cabinet module position. (See Figs. A and B.)

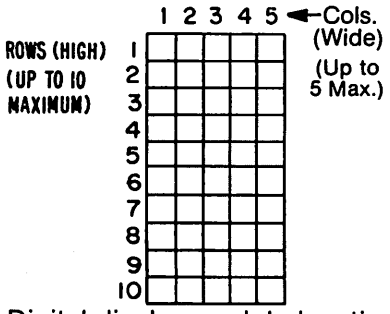
For monitoring more than 100 points (200 maximum) or for system matrix arrangements exceeding five columns wide (10 maximum), the digital display will occupy any one cabinet module position, **plus two card slots in one adjacent module position.** (See Figs. C and D.)

Any one of the five locations may be used, e.g. if the digital display is to be located in the bottom row, the option positions available would be numbers 1, 2, or 3. If the digital display is located in bottom row, far right hand position, the option module position number 3 must be used to accommodate the additional two cards.

## Fig. A — 100 Point System Card Arrangement
**(90FD Front Display Removed)**



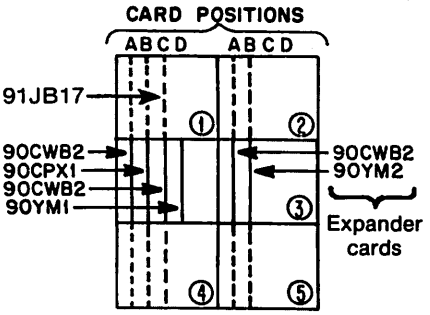
## Fig. B — 100 Point System Display Module Location




Digital display module location is open to any position within an integral annunciator. All B and D module card positions will accommodate meter set analog cards (98 max.).

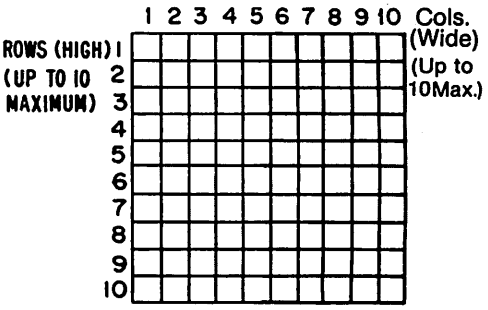
## Fig. C — 200 Point System Card Arrangement

(90 FD Front Display Removed)




Front view, display module location. Expander cards may be located in any one module, 1 thru 5 only. 90FD5 (only) requires a 91JB17 in module 1 or 4.

## Fig. D — 200 Point System Display Module Location




Digital display module location is open to any position within an integral annunciator. Display and expander modules must be adjacent. All B and D module card positions will accommodate meter set analog cards (197 max.).

## Input & Readout Information

| MODEL NUMBER DESIGNATION | TRANSDUCER TYPE | INPUT TYPE | SCALE DISPLAYED | ALTERNATE SCALE DISPLAYED | TYPE CODE DISPLAYED |
|---|---|---|---|---|---|
| AXD1<br>AXD2<br>AXD3<br>AXD4<br>AXD5<br>AXD6 | Active Instrumentation Signal | V or mA*<br>0.2 to 1.0V<br>0 to 1.0V<br>1.0 to 5.0V<br>0 to 10V<br>-5 to +5V<br>-10 to +10V | 0.0 to 100.0E (Percent) | 0.0 to 100.0r or Customer Requested Scale | E. (Linear) or E (Square Root) or Customer Request |
| PXD1<br>PXD2<br>PXD3 | Passive Instrumentation Signal | 0.4 to 2.0mA<br>1.0 to 5.0mA<br>4.0 to 20.0mA | | | |
| LC1<br>LC2<br>LC3<br>LC4 | Load Cell (Strain Gauge) | 5.0mV/V MAX.@ 10V<br>3.5mV/V MAX.@ 10V<br>10.0mV/V MAX.@ 5V<br>7.0mV/V MAX.@ 5V | | | |
| R1<br>R2<br>R3<br>R4 | RTD | Cu 10ohm @ 25° C<br>Pt 100ohm @ 0° C DIN<br>Ni 120ohm @ 0° C<br>Ni 100ohm @ 0° C DIN | -70° to 150° C<br>-200° to 600° C<br>-60° to 180° C<br>-60° to 180° C | -94° to 302° F<br>-328° to 1112° F<br>-76° to 356° F<br>-76° to 356° F | 8<br>9<br>b<br>A |
| TC1<br>TC2<br>TC3<br>TC4<br>TC5<br>TC6 | Thermocouple | Type J<br>Type K<br>Type T<br>Type E<br>Type R<br>Type S | 0 to 760° C<br>0 to 1260° C<br>-185 to 370° C<br>-185 to 870° C<br>0 to 1500° C<br>0 to 1500° C | 32 to 1400° F<br>32 to 2300° F<br>-301 to 698° F<br>-301 to 1598° F<br>32 to 2732° F<br>32 to 2732° F | 3<br>4<br>7<br>2<br>5<br>6 |
| TM1<br>TM2<br>TM3<br>TM4<br>TM5<br>TM6<br>TM7 | Thermistor | 100 ohm @ 25° C<br>300 ohm @ 25° C<br>500 ohm @ 25° C<br>1000 ohm @ 25° C<br>2252 ohm @ 25° C<br>3000 ohm @ 25° C<br>5000 ohm @ 25° C | -70 to 25° C<br>-50 to 60° C<br>-40 to 75° C<br>-25 to 90° C<br>-10 to 115° C<br>0 to 125° C<br>10 to 150° C | -94 to 77° F<br>-58 to 140° F<br>-40 to 167° F<br>-13 to 194° F<br>14 to 239° F<br>32 to 257° F<br>50 to 302° F | 1.<br>2.<br>3.<br>4.<br>5.<br>6.<br>7. |

*Models AXD1 or AXD2 are used for current monitoring of active instrumentation signals.

## Digital Display Error Codes

The Series 90 meter set analog monitoring system provides diagnostic indication of operational malfunctions on its digital display screen. This helpful and accurate identification of errors in the system data communication network speeds the correction procedure.

**Code** **Error**

Err 1 — 91AD analog card does not respond or no analog card located in the module position selected. (See Fig. E.)

Err 2 — Data bus (P3) shorted.

Err 3 — Information transfer timing, between 91AD analog card and the digital display, is incorrect.

Err 4 — Noise on the P3 data line.

Err Pt — Appears during a normal power up or when a 91AD analog card is inserted into its module.

Err SF — Open or shorted sensor or sensor wire, sensor failure.

Err AO — 91AD analog card is unable to self-calibrate.

Err HI — Sensor reading is up to 10% over range. (See Fig. F.)

Err LO — Sensor reading is up to 5% under range. (See Fig. G.)

Err 11 — The digital display has controls set in an undefined combination or the digital display has a circuit failure. (See Fig. H.)

Err 15, Err 16 — Internal program error.

Clr Pt — Reset program operation.


Fig. E


Fig. F


Fig. G

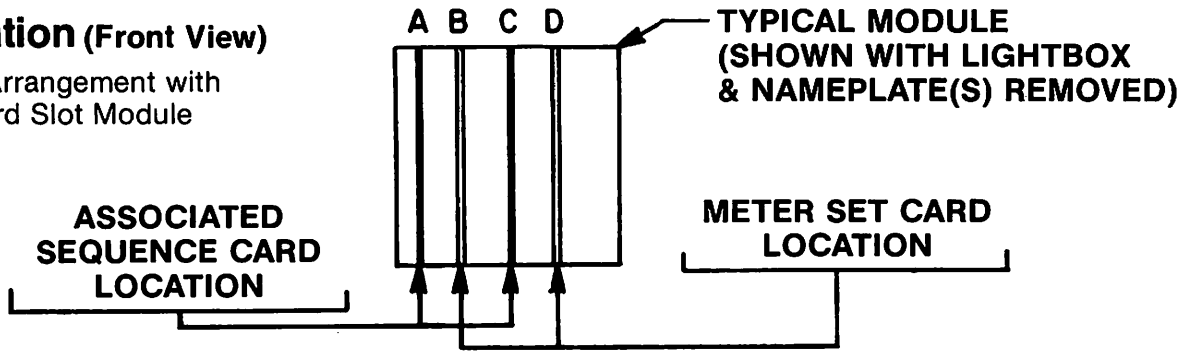

Fig.H

Meter Set (Code AD) Without Analog Output

# Card Location, Terminal Designations, And Card Jumper Information

## Card Location (Front View)

Typical Card Arrangement with Standard 4 Card Slot Module




(Sequence card pos. A, interfaced with meter set analog card pos. B.)
(Sequence card pos. C, interfaced with meter set analog card pos. D, if used.)

## Terminal Designations

| | |
|---|---|
| 1, 2, 3 | Field input as required by transducer input type used. See Pg. 27 |
| 4 | |
| 5 | Not used. |
| 6 | Output signal to analog output card (when used). |
| 7 | Digital display communication bus. |

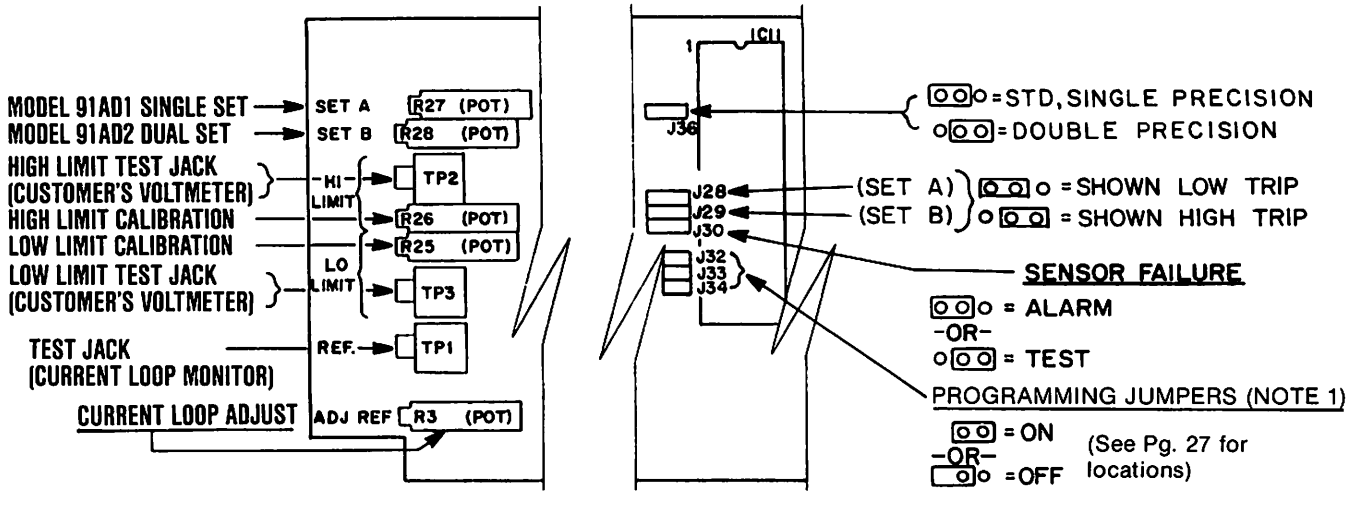
Card Slot B or D, Analog Input Card Model 91AD*
*Complete model no. for specific requirements, see Pg. 29

| | |
|---|---|
| 1, 2 | Auxiliary output. |
| 3 | Grouping for First Out sequences. |
| 4, 5 | Auxiliary output. |
| 6 | Auxiliary output or lamp output for two-color sequence. |
| 7 | Lamp output (remote logic) or slave lamp (integral logic). |

Card Slot A or C, Sequence Card
Model 91***DM12DC or 92***DM12DC
***Sequence code, see Pgs. 20-23

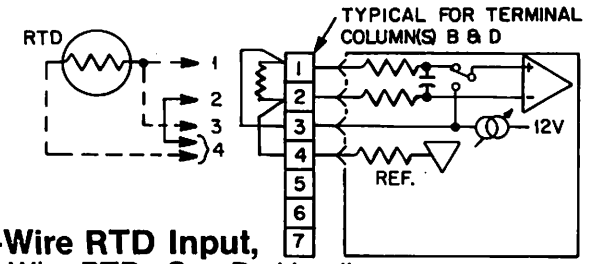
## Card Jumper Locations

Meter Set Analog Card Calibration Pot and Jumper Location



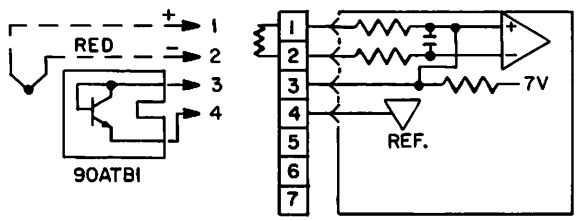

1. R, TC, AXD, PXD, and LC do not have programming jumpers.
2. R does not have J36 feature.
3. AXD and PXD do not have current loop adjust.
4. TC input code, R3 is cold junction adjust pot.

# Signal Input Connections



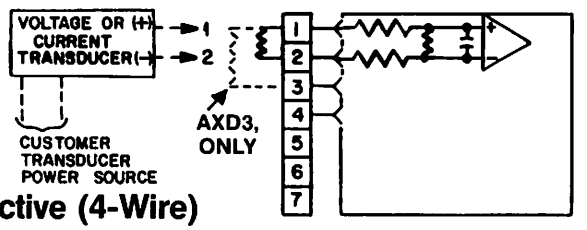

## 3-Wire RTD Input, (2-Wire RTDs Can Be Used)

| ① MODEL NO. | RANGE ③ | FACTORY INSTALLED RESISTOR |
|---|---|---|
| 91AD•R1 | -70 to 150°C | 10 ohm, 5%, 1/4W, P/N 630035/1 |
| 91AD•R2 | -200 to 600°C | 150 ohm, 5%, 1/4W, P/N 631411/1 |
| 91AD•R3 | -60 to 180°C | 150 ohm, 5%, 1/4W, P/N 631411/1 |
| 91AD•R4 | -60 to 180°C | 150 ohm, 5%, 1/4W, P/N 631411/1 |




## Thermocouple Input

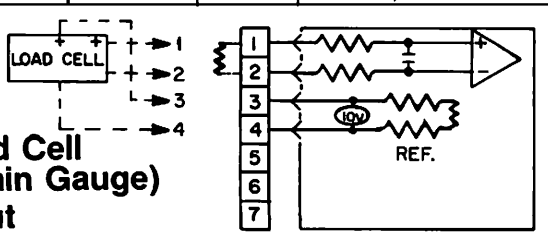
| ① MODEL NO. | RANGE | FACTORY INSTALLED RESISTOR |
|---|---|---|
| 91AD•TC• | ALL | 4.7K ohm, 5%, 1/4W, P/N 630386/1 |




## Active (4-Wire) Transducer Input (V or mA)

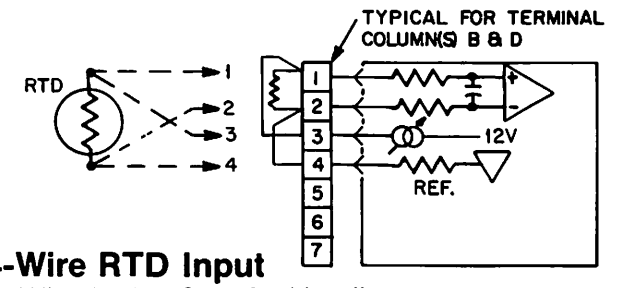
| ① MODEL NO. | RANGE | FACTORY INSTALLED RESISTOR |
|---|---|---|
| 91AD•AXD1 | 0.2 to 1.0V | 470K ohm, 5%, 1/4W, P/N 630654/1 |
| 91AD•AXD2 | 0.0 to 1.0V | 220K ohm, 5%, 1/4W, P/N 630624/1 |
| 91AD•AXD3 | 1 to 5V | 2.2M ohm, 5%, 1/4W, P/N 630701/1 |
| 91AD•AXD4 | 0 to 10V | NONE REQUIRED |
| 91AD•AXD5 | -5 to +5V | NONE REQUIRED |
| 91AD•AXD6 | -10 to +10V | NONE REQUIRED |
| 91AD•AXD7 | -1 to +1V | NONE REQUIRED |

| ② MODEL NO. | RANGE | AUX. T.B. REQ'D | VALUE IN OHMS (1%, MF) |
|---|---|---|---|
| 91AD•AXD2 | 0 to 4mA | 90ATB6 | 249 ohm, P/N 631541, 1/8W |
| 91AD•AXD1 | 1 to 5mA | 90ATB5 | 200 ohm, P/N 631540 |
| 91AD•AXD1 | 4 to 20mA | 90ATB4 | 49.9 ohm, P/N 631539 |
| 91AD•AXD1 | 10 to 50mA | 90ATB3 | 20 ohm, P/N 631538 |
| 91AD•AXD1 | 0.4 to 2mA | 90ATB7 | 499 ohm, P/N 631542 |
| 91AD•AXD2 | 0 to 1mA | 90ATB8 | 1 K ohm, P/N 631543 |



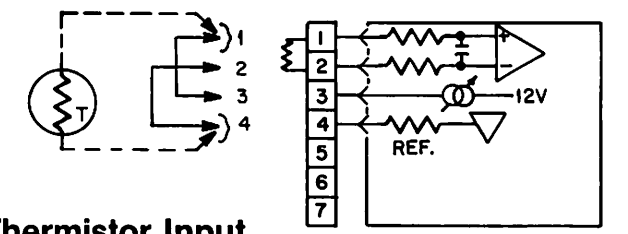

## Load Cell (Strain Gauge) Input

| ① MODEL NO. | RANGE | FACTORY INSTALLED RESISTOR |
|---|---|---|
| 91AD•LC• | ALL | 4.7K ohm, 5%, 1/4W, P/N 630386/1 |




## 4-Wire RTD Input (2-Wire RTDs Can Be Used)

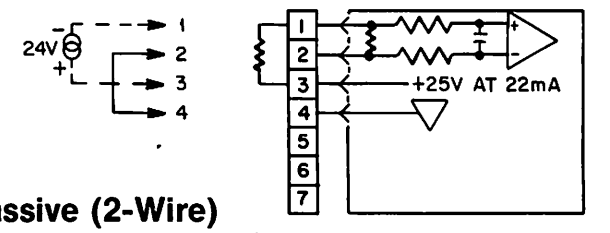
| ① MODEL NO. | RANGE ③ | FACTORY INSTALLED RESISTOR |
|---|---|---|
| 91AD*R1 | -70 to 150°C | 10 ohm, 5% 1/4W, P/N 630035/1 |
| 91AD*R2 | -200 to 600°C | 150 ohm, 5% 1/4W, P/N 631411/1 |
| 91AD*R3 | -60 to 180°C | 150 ohm, 5% 1/4W, P/N 631411/1 |
| 91AD*R4 | -60 to 180°C | 150 ohm, 5% 1/4W, P/N 631411/1 |




## Thermistor Input

| ① MODEL NO. | RANGE | FACTORY INSTALLED RESISTOR |
|---|---|---|
| 91AD•TM• | ALL | 2.2K ohm, 5%, 1/4W, P/N 631029/1 |

| PROGRAMMING JUMPER LOCATION | | |
|---|---|---|
| MODEL NUMBER | ON | OFF |
| 91AD•TM1 | J33, J34 | J32 |
| 91AD•TM2 | J32, J34 | J33 |
| 91AD•TM3 | J34 | J32, J33 |
| 91AD•TM4 | J32, J33 | J34 |
| 91AD•TM5 | J33 | J32, J34 |
| 91AD•TM6 | J32 | J33, J34 |
| 91AD•TM7 | | J32, J33, J34 |




## Passive (2-Wire) Transducer Input (mA)

| ① MODEL NO. | RANGE | FACTORY INSTALLED RESISTOR |
|---|---|---|
| 91AD•PXD1 | 0.4 to 2.0mA | 47K ohm, 5%, 1/4W, P/N 630064/1 |
| 91AD•PXD2 | 1 to 5mA | 10K ohm, 5%, 1/4W, P/N 630469/1 |
| 91AD•PXD3 | 4 to 20mA | 2.2K ohm, 5%, 1/4W, P/N 631029/1 |

## Notes:

① The resistors and jumpers shown are factory installed to prevent sensor failure indication on unassigned positions. **Remove** resistors and jumpers only when position is assigned.

② Resistor shown is located on 90ATB• and must **remain in place** when position is assigned.

③ Equivalent °F ranges are switch selectable on digital display.

# SERIES90 Meter Set (Code AD)
## Analog Output Capability

Series 90 meter set analog monitoring systems are capable of providing linearized 1 - 5V or 4 - 20mA isolated output signals. Such signals will encompass the range of the input type selected or can be calibrated to respond only to a segment of the total range (as small as 20% of the monitored range, Option 1GA).

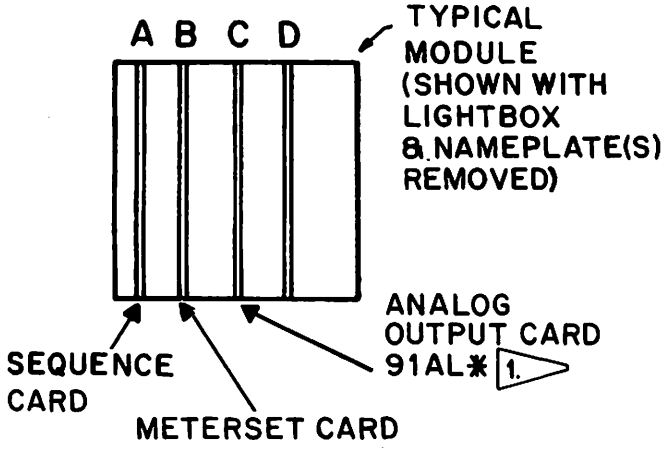
Model 91AL* analog output cards receive a data signal from the Model 91AD* analog input card corresponding to the field signal monitored.

Integral mounting of the Model 91AL* analog output card is illustrated below. Remote mounting also is available for high density window configurations.

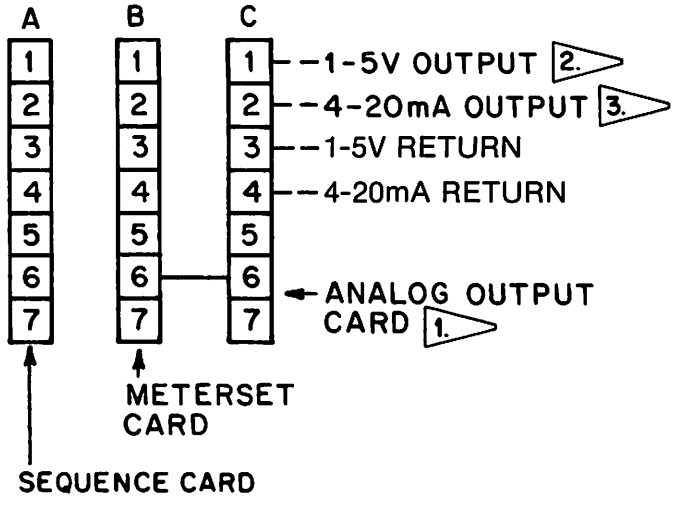
For analog output accuracy, see Pg. 5

| Analog Output Card No. | Output Signal |
|---|---|
| Model 91AL1 | 4 to 20mA |
| Model 91AL2 | 1 to 5V |
| Model 91AL3 | 4 to 20mA and 1 to 5V |

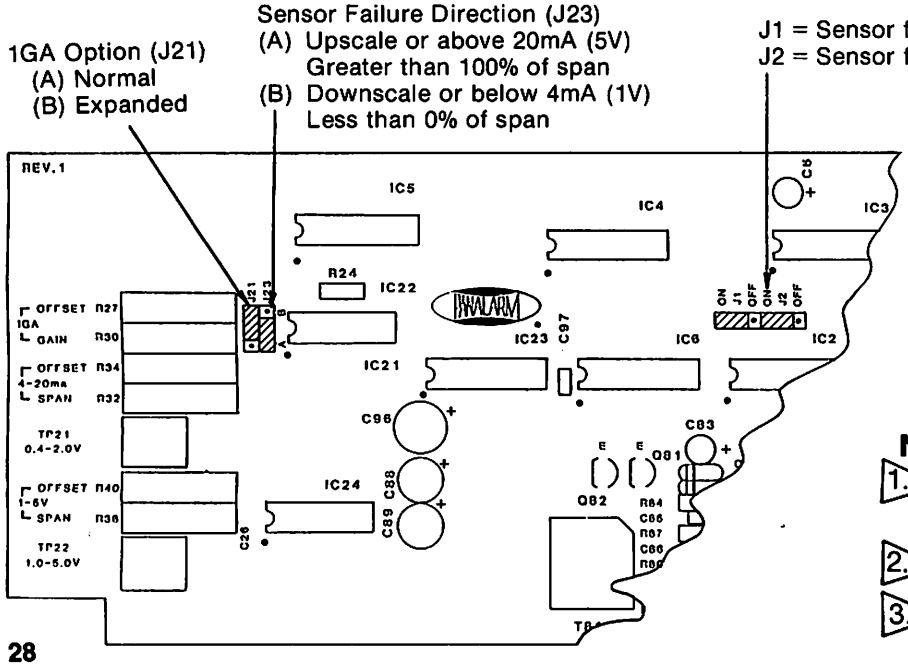
## Typical Card Arrangement with Standard Module




## Typical Wiring Diagram




## Analog Output Card Calibration Pot and Jumper Location




**Notes:**

1. Model 91AL* analog output cards can be mounted in any module in the system.
2. Models 91AL2 or 91AL3.
3. Models 91AL1 or 91AL3.

# SERIES 90 Model Numbers, Input & Range Information

## Meter Set (Code AD)

Model No. Explanation:

**91AD** ____ ____ **X** ____

Options
1NE = No transducer excitation④
2RE = Square root extraction②
Deadband Option
(This field not required if standard deadband is used).
Standard = 1%
1FDB = 0.5% 3FDB = 5.0%
2FDB = 2.0% 4FDB = 10.0%
X = Indicates place holder when additional options are required
Input Code (select from charts, below)
Setpoint
1 = Single setpoint 2 = Dual setpoint

| INPUT CODE | TRANSDUCER TYPE | INPUT | SCALE DISPLAY ③ |
|---|---|---|---|
| AXD1 | Active Instrumentation Signal | 0.2 to 1.0V | 0.00 - 100.0E (Percent) |
| ADX2 | | 0 to 1.0V | |
| AXD3 | | 1.0 to 5.0V | |
| AXD4 | | 0 to 10V | |
| AXD5 | | -5 to +5V | |
| AXD6 | | -10 to +10V | |
| AXD7 | | -1 to +1V | |
| PXD1 | Passive Instrumentation Signal | 0.4 to 2.0mA | 0.0 - 100.0E (Percent) |
| PXD2 | | 1.0 to 5.0mA | |
| PXD3 | | 4.0 to 20.0mA | |
| LC1 | Load Cell (Strain Gauge) | 5.0mV/V max. @ 10V | 0.0 - 100.0E (Percent) |
| LC2 | | 3.5mV/V max. @ 10V | |
| LC3 | | 10.0mV/V max. @ 5V | |
| LC4 | | 7.0mV/V max. @ 5V | |
| R1 | 2, 3 or 4 Wire RTD | Cu, 10 ohm @ 25°C | -70 to 150°C |
| R2 | | Pt,100 ohm @ 0°C,DIN.STD | -200 to 600°C |
| R3 | | Ni, 120 ohm @ 0°C | -60 to 180°C |
| R4 | | Ni,100 ohm @ 0°C,DIN.STD | -60 to 180°C |

| INPUT CODE | TRANSDUCER TYPE | INPUT | SCALE DISPLAY③ |
|---|---|---|---|
| TC1 | Thermocouple | Type J | 0 to 760°C |
| TC2 | | Type K | 0 to 1260°C |
| TC3 | | Type T | -185 to 370°C |
| TC4 | | Type E | -185 to 870°C |
| TC5 | | Type R | 0 to 1500°C |
| TC6 | | Type S | 0 to 1500°C |
| TM1 | Thermistor | 100 ohm @ 25°C | -70 to 25°C |
| TM2 | | 300 ohm @ 25°C | -50 to 60°C |
| TM3 | | 500 ohm @ 25°C | -40 to 75°C |
| TM4 | | 1000 ohm @ 25°C | -25 to 90°C |
| TM5 | | 2252 ohm @ 25°C | -10 to 115°C |
| TM6 | | 3000 ohm @ 25°C | 0 to 125°C |
| TM7 | | 5000 ohm @ 25°C | 10 to 150°C |

**NOTES**

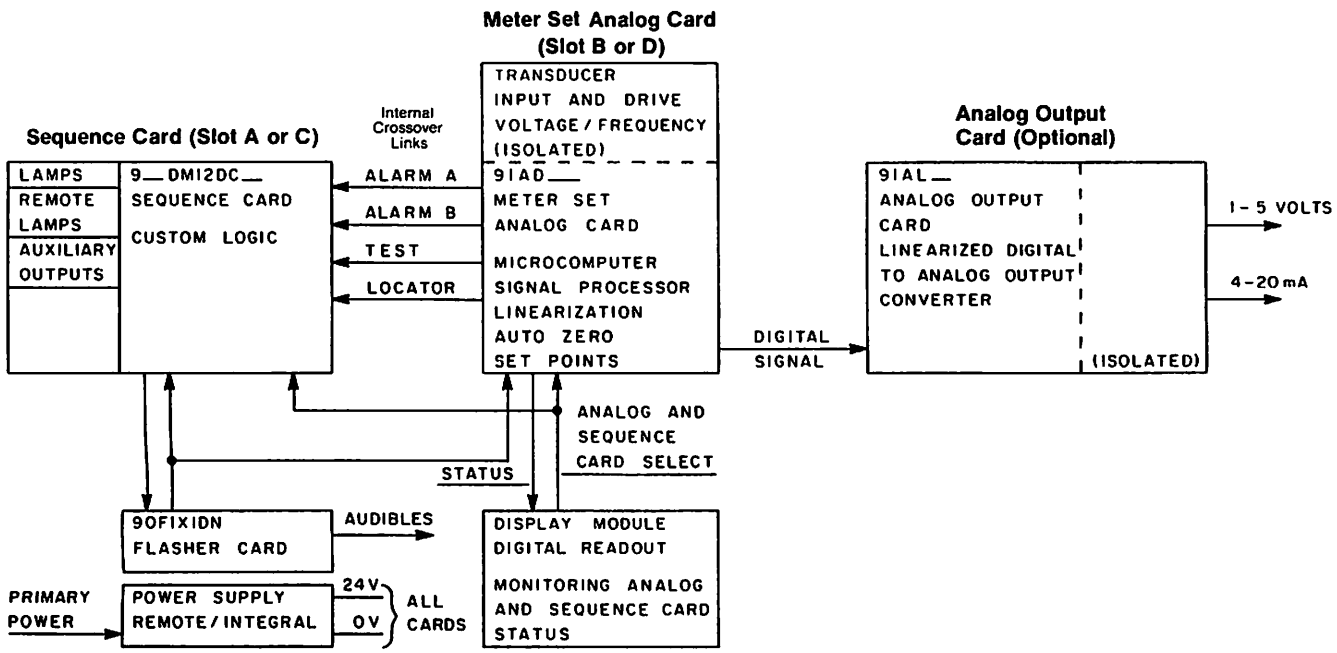
1 Cards or options requiring the use of the (P1), (P2) or (P3) option busses cannot be used in the same horizontal chassis row with meter set analog cards.

② Defined on AXD*, PXD* and LC* only.

③ Temperature scales are listed in °C. Equivalent °F may also be displayed (switch selectable).

④ For monitoring multiple (3 or 4) set points from one transducer, the first dual-set card (setpoints 1 and 2) should have transducer excitation. The second (setpoints 3 and 4) should have "1NE" option. (LC*, R* and TM* only).

## TYPICAL SYSTEM FUNCTION BLOCK DIAGRAM Meter Set Analog Systems (Code AD)

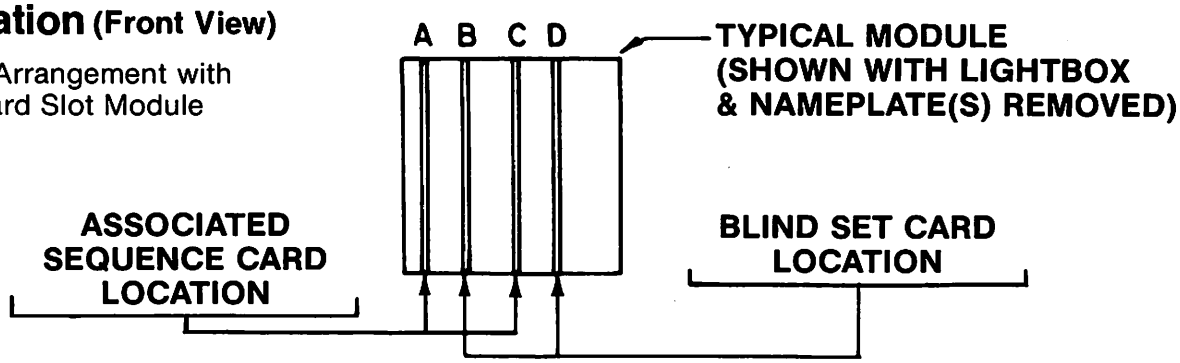


Blind Set Analog (Code AB)

# Card Location, Terminal Designations, And Card Jumper Information

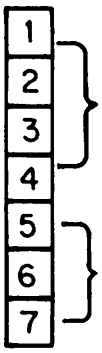
## Card Location (Front View)

Typical Card Arrangement with Standard 4 Card Slot Module




(Sequence card pos. A, interfaced with blind set analog card pos. B.)
(Sequence card pos. C, interfaced with blind set analog card pos. D, if used.)

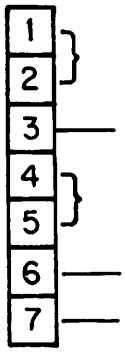
## Terminal Designations




Field input as required by transducer input type used. See Pg. 31

Not used.

Card Slot B or D, Analog Input Card Model 91AB*
*Complete model no. for specific requirements, see Pg. 32.




Auxiliary output.

Grouping for First Out sequence.

Auxiliary output.

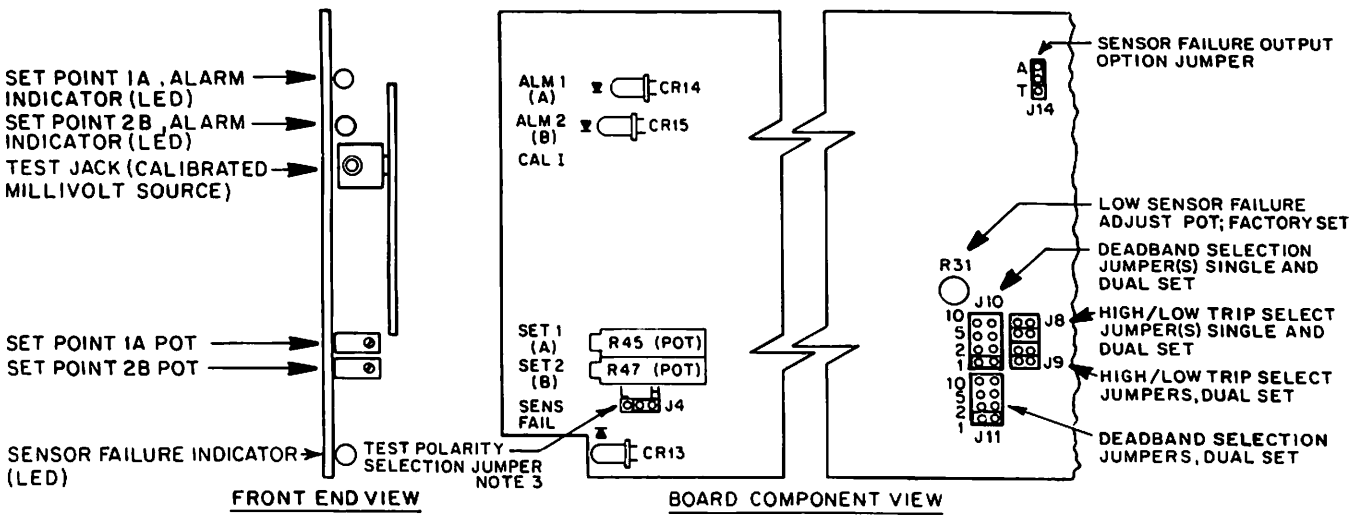
Auxiliary output or lamp output for two-color sequences.

Lamp output (remote logic) or slave lamp (integral logic).

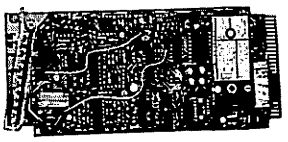
Card Slot A or C, Sequence Card
Model 91***DB12DC or 92***DB12DC
***Sequence code, see Pgs. 20-23.

## Card Jumper Location

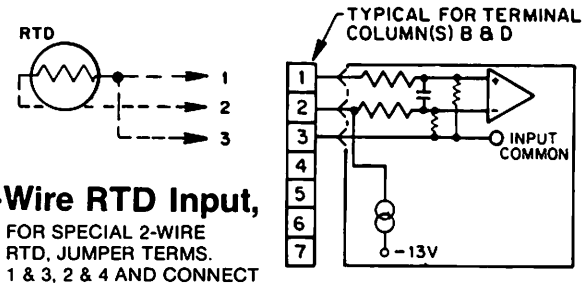
Blind Set Analog Card Calibration Pot, Test Jack, Indicator, and Jumper Location




Typical analog card shown above is for RTD inputs. Consult Instruction Manual and wiring diagrams for thermocouple, thermistor, current (mA), voltage, and load cell (strain gauge) inputs.



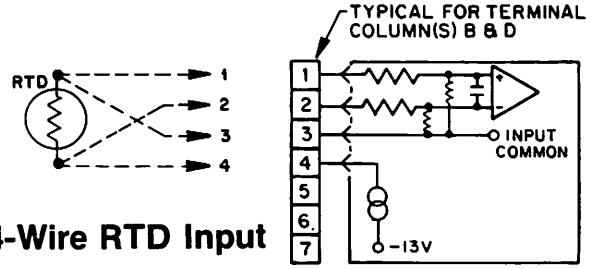
Blind set analog input card.




## 3-Wire RTD Input,

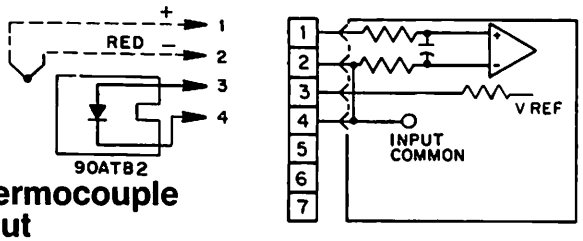
NOTE: FOR SPECIAL 2-WIRE RTD, JUMPER TERMS. 1 & 3, 2 & 4 AND CONNECT RTD TO TERMINALS 1 & 2.

| MODEL NO. | RANGE | RTD TYPE |
|---|---|---|
| 91AB·R1 | -70 to 150°C | 10 ohm COPPER |
| 91AB·R2 | -200 to 600°C | 100 ohm PLATINUM |
| 91AB·R3 | -60 to 180°C | 120 ohm NICKEL |



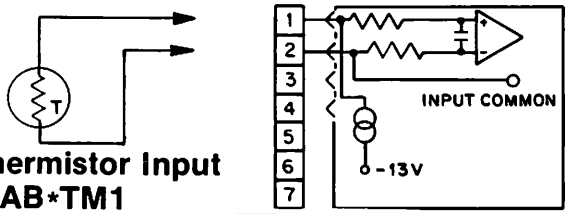

## 4-Wire RTD Input

| MODEL NO. | RANGE | RTD TYPE |
|---|---|---|
| 91AB·RR1 | -70 to 150°C | 10 ohm COPPER |
| 91AB·RR2 | -200 to 600°C | 100 ohm PLATINUM |
| 91AB·RR3 | -60 to 180°C | 120 ohm NICKEL |



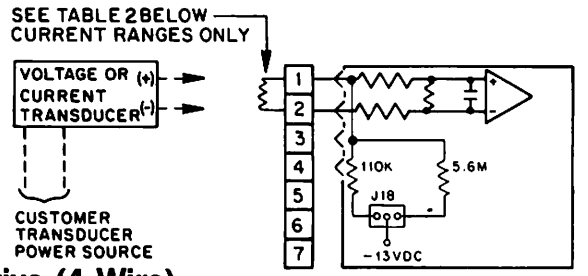

## Thermocouple Input

| MODEL NO. | RANGE | THERMOCOUPLE TYPE |
|---|---|---|
| 91AB·TC1 | 0 to 760°C | J |
| 91AB·TC2 | 0 to 1260°C | K |
| 91AB·TC3 | -185 to 370°C | T |
| 91AB·TC4 | -185 to 870°C | E |




## Thermistor Input 91AB*TM1

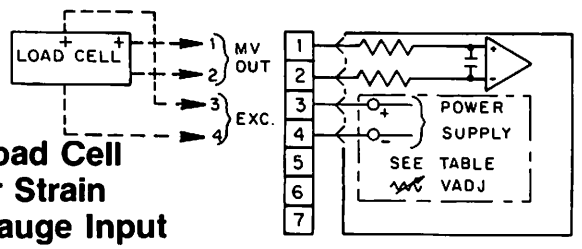
| THERMISTOR RESISTANCE IN OHMS AT 25°C | RANGE °C | SUGGESTED THERMISTOR TYPES | |
|---|---|---|---|
| | | FENWAL PART NO. | YELLOW SPRINGS INST. PART NO. |
| 100 | -70 to +25 | UUD21J1 | 44001A |
| 300 | -50 to +60 | UUD23J1 | 44002A |
| 500 | -40 to +75 | UUB25J1 | NONE |
| 1000 | -25 to +100 | UUB31J1 | 4403A |
| 2252 | -5 to +115 | UUA32J3 | 44004 |
| 3000 | 0 to 125 | UUA33J1 | 44005 |
| 5000 | 10 to 145 | UUA35J1 | 44007 |




## Active (4-Wire) Transducer Input (V or mA)

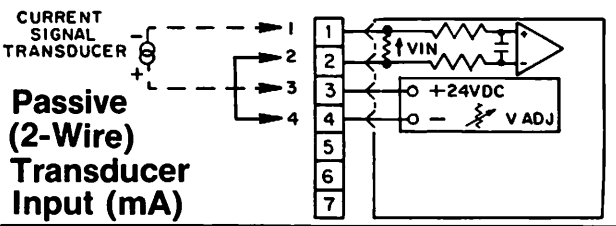
| MODEL NO. | RANGE | J3 POSITION | J7 POSITION |
|---|---|---|---|
| 91AB·AXD1 | 0 to 1.0V | R | Z |
| | 1 to 5.0V | S | W |
| | 0 to 10V | T | Z |
| | -5 to +5V | T | X |
| | -10 to +10V | U | X |
| | ALL CURRENT | R | W |

| MODEL NO. | RANGE | AUX. T.B. REQ'D | VALUE IN OHMS (1% MF) |
|---|---|---|---|
| 91AB·AXD1 | 10 to 50mA | 90ATB11 | 24.9 |
| | 4 to 20mA | 90ATB9 | 61.9 |
| | 1 to 5mA | 90ATB6 | 249 |
| | 0.4 to 2mA | 90ATB10 | 619 |




## Load Cell or Strain Gauge Input

| MODEL NO. | RANGE | POWER SUPPLY VOLTAGE |
|---|---|---|
| 91AB·LC1 | 50 MILLIVOLT | 10.0V DC |
| 91AB·LC2 | 50 MILLIVOLT | 5.0V DC |




## Passive (2-Wire) Transducer Input (mA)

| MODEL NO. | RANGE | CARD MTD. RESISTOR | V. IN @ MAX. CUR. |
|---|---|---|---|
| 91AB·PXD1 | 0.4 to 2mA | 619 ohm | 1.24V |
| 91AB·PXD2 | 1 to 5mA | 249 ohm | 1.25V |
| 91AB·PXD3 | 4 to 20mA | 61.9 ohm | 1.24V |

# SERIES90 Model Numbers, Input & Range Information

## Blind Set (Code AB)

Model No. Explanation:

**91AB** ____ ____ **X** ____

- Option
  - 1NE = No transducer excitation②
  - X = Indicates place holder when additional options are required
- Input Code (select from charts, below)
- Setpoint
  - 1 = Single setpoint  2 = Dual setpoint

| INPUT CODE | TRANSDUCER TYPE | INPUT | OPERATIONAL RANGE③ |
|---|---|---|---|
| AXD1 | Active Instrumentation Signal | 0 to 1.0V<br>1 to 5.0V<br>0 to 10V<br>-5 to +5V<br>-10 to +10V<br>0.25 to 1.25V<br>(4-20mA)<br>(Jumper selectable) | 0 - 100% |
| PXD1<br>PXD2<br>PXD3 | Passive Instrumentation Signal | 0.4 to 2.0mA<br>1.0 to 5.0mA<br>4.0 to 20.0mA | 0 - 100% |
| LC1<br>LC2 | Load Cell (Strain Gauge) | 2.0 to 5.0mV/V max. @ 10V<br>4.0 to 10.0mV/V max. @ 5V | 0 - 100% |
| R1<br>R2<br>R3 | 3-Wire RTD | Cu,10 ohm @ 25°C<br>Pt,100 ohm @ 0°C,DIN.STD<br>Ni,120 ohm @ 0°C | -70 to 150°C<br>-200 to 600°C<br>-60 to 180°C |
| RR1<br>RR2<br>RR3 | 4-Wire RTD | Cu,10 ohm @ 25°C,<br>Pt,100 ohm @ 0°C,DIN.STD<br>Ni,120 ohm @ 0°C | -70 to 150°C<br>-200 to 600°C<br>-60 to 180°C |
| TC1<br>TC2<br>TC3<br>TC4 | Thermocouple | Type J<br>Type K<br>Type T<br>Type E | 0 to 760°C<br>0 to 1260°C<br>-185 to 370°C<br>-185 to 870°C |
| TM1 | Thermistor | 100 ohm @ 25°C<br>300 ohm @ 25°C<br>500 ohm @ 25°C<br>1000 ohm @ 25°C<br>2252 ohm @ 25°C<br>3000 ohm @ 25°C<br>5000 ohm @ 25°C | -70 to 25°C<br>-50 to 60°C<br>-40 to 75°C<br>-25 to 90°C<br>-10 to 115°C<br>0 to 125°C<br>10 to 150°C |

**NOTES**

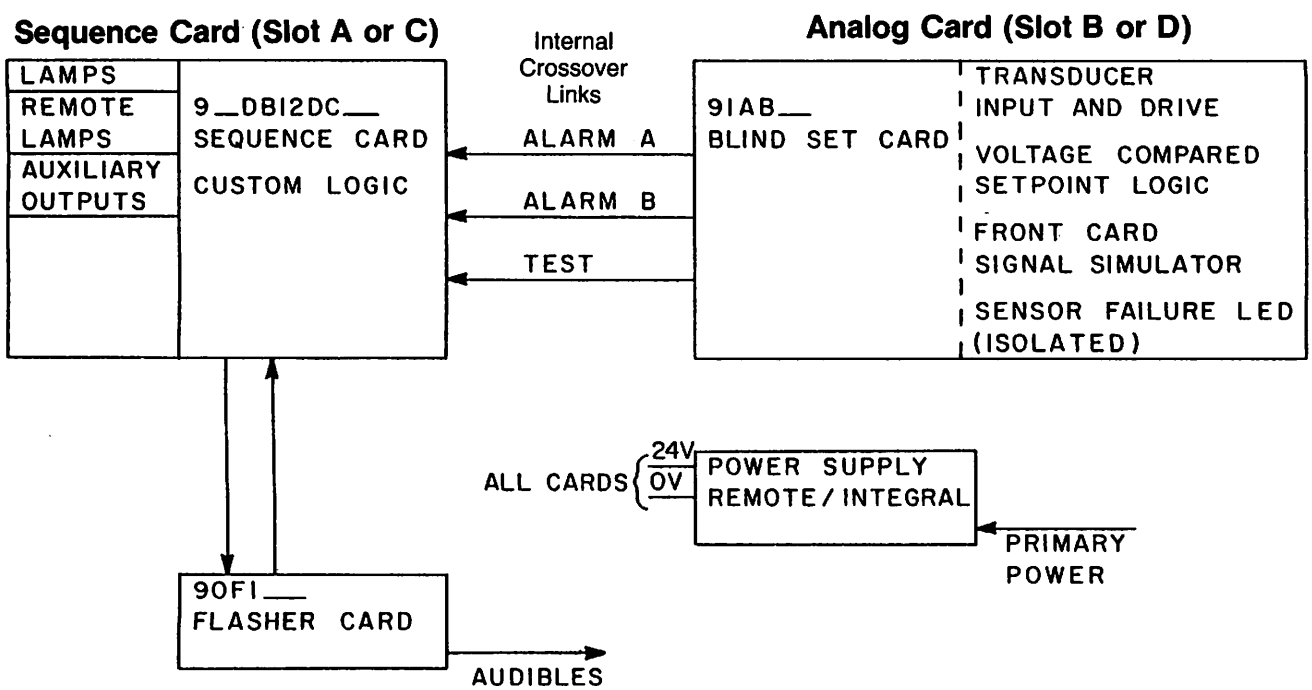
1 Deadband options are jumper selectable on board. 0.5%, 2%, 5% and 10%. Standard is 1%.

② For monitoring multiple (3 or 4) set points from one transducer, the first dual-set card (setpoints 1 and 2) should have transducer excitation. The second (setpoints 3 and 4) should have "1NE" option. (LC*, R*, RR* and TM* only).

③ Operational range shown for reference only. To convert to degrees fahrenheit use the following formula (°C x 1.8) + 32 = °F

## Typical System Function Block Diagram

### Blind Set Analog Systems (Code AB)

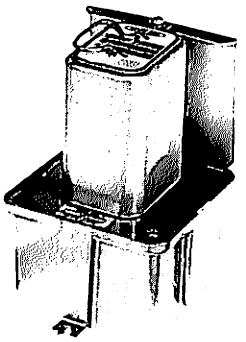


# SERIES90 Remote Options

### Auxiliary Relay— Model 90AX1

### Power Failure Monitor— Model 90AX2

Remote mounted auxiliary relay for horn output, common contacts on alarm and for grouping electronic outputs. Provides three Form C outputs. Add suffix 1 to 90AX for de-energized in normal; 2 for energized in normal; also used for power failure monitor.



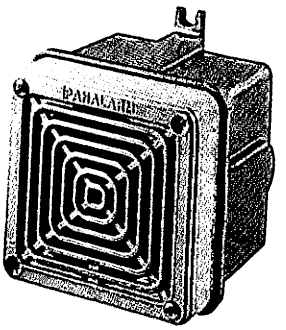
### Audibles

**MODEL NT2-24D**

Novatone horn, 16 field selectable tones. Aux. relay not required.

**MODEL HSA/HSD**

HSA, 120/50-60Hz. HSD, 125V DC. Both require Model 90AX* auxiliary relay.



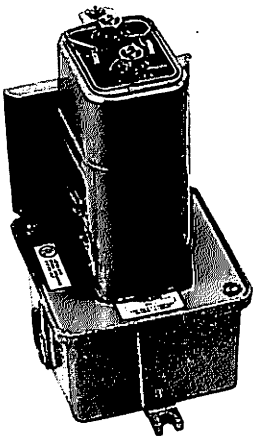
### Field Wiring Ground Monitor

Monitors FC (+) and FCC (-) wiring of isolated signal voltage source. Source may be either Series 90 power supply (FCC not jumpered to 0V) or a separate power source.

If Series 90 power supply FCC is jumpered to 0V, the 50-DCF3 will monitor FC, FCC, +24 and 0V.

The 50-DCF3 has two top mounted potentiometers, one for adjusting (+) and one for adjusting (-) sensitivity up to 1.5 megohms.

For minimum allowable leakage resistance, see "Sequence Card Signal Input" section on page 4.



**MODEL 50DCF3-***

### Pushbuttons

Remote pushbuttons can be used in lieu of or in addition to integral pushbuttons.

The SW-102 has 1 N.O. and 1 N.C. momentary contact. Other versions in the SW-* line are available as well as different construction, e.g. mercury bottle, fiber optic, etc.


**MODEL SW102**

## Accessory Items Required For And Included With Systems Using Meter Set (91AD*) Or Blind Set (91AB*) Analog Cards

**Model 90ATB* Auxiliary Terminal Boards**

These units contain various components (resistors, diodes, transistors) as required to accomplish cold junction compensation or current to voltage conversion as indicated in the following chart. The units will be factory mounted on customer terminals (normally TB1 and TB2).

| Model No. | Used With Meterset Model | Used With Blindset Model |
|---|---|---|
| 90ATB1 | 91AD*TC* (COLD JUNCTION COMP) | |
| 90ATB2 | | 91AB*TC* (COLD JUNCTION COMP) |
| 90ATB3 | 91AD*AXD1 (10-50 mA) | |
| 90ATB4 | 91AD*AXD1 (4-20 mA) | |
| 90ATB5 | 91AD*AXD1 (1-5 mA) | |
| 90ATB6 | 91AD*AXD2 (0-4 mA) | 91AB*AXD1 (1-5 mA) |
| 90ATB7 | 91AD*AXD1 (0.4-2 mA) | |
| 90ATB8 | 91AD*AXD2 (0-1 mA) | |
| 90ATB9 | | 91AB*AXD1 (4-20 mA) |
| 90ATB10 | | 91AB*AXD1 (0.4-2 mA) |
| 90ATB11 | | 91AB*AXD1 (10-50 mA) |
| 90ATB12 | 91AD*AXD2 (0-100$\mu$A) | |

**Model 90TP2 Test Probes**

Analog input cards have subminiature board mounted calibration jacks accessible through the card handle. These test probes have mating plugs and leads for connection of customer's meter during field calibration procedures.

# SERIES90 Miscellaneous Integral Auxiliary And "System Common" Items

## AUX OUTPUT CARDS

**Model 90AXC*.** Each card occupies one position (card slot).

**90AXC1** Single electronic or FH or SH input. Single form C relay contact output.

**90AXC2X2A** Dual electronic or FH or SH inputs. Dual form A (N.O.) relay contact outputs.

**90AXC2X2B** Dual electronic or FH or SH inputs. Dual form B (N.C.) relay contact outputs.

**90AXC3** Dual electronic inputs via crossover links from an adjacent twinpoint card. Dual form C relay contact outputs.

**90AXC3X1J** Same as above except inputs jumpered together to operate from single point card.

**90AXC4** Dual electronic or FH or SH inputs. Dual opto-isolator outputs.

**90AXC5X2KC** Dual electronic input via crossover links from an adjacent twin point card. Dual opto isolator/collector pullup resistor outputs.

**90AXC5X2KC1J** Same as above except inputs jumpered together to operate from single point card.

**90AXC5X2KE** Dual electronic inputs via crossover links from an adjacent twin point card. Dual opto isolator/emitter pullup resistor outputs.

**90AXC5X2KE1J** Same as above except inputs jumpered together to operate from an adjacent single point card.

**90AXC6** One electronic or FH or SH input with mechanical relay form C contact output *AND* one input from sequence card lamp output with solid state relay output (opto-isolated triac).

**90AXC7** Dual inputs from sequence card lamp outputs with dual contact outputs for operating repeater lamps.

**90AXC8** Single electronic or FH or SH input. Two form C relay contact outputs.

## CHASSIS WIRING BOARDS

**Model 90CWB*.** These (except 90CWB6) are very short boards, usually factory installed, which are used behind a plug-in unit such as a 90P1X power supply.

**90CWB1** Installed in card socket, connects busses to customer terminals. Customer terminals become "right main bus" terminals.

**90CWB2** Installed in card socket, connects crossover links to customer terminals. Used with Meter Set Analog systems only.

**90CWB3** Installed in card socket, connects FC output of 90P1X* power supply to one row of customer terminals (all FC's).

**90CWB5** Dual card wiring board required in 94 style modules for interconnecting 90P3* to 90PT* (power transfer).

**90CWB6** For use in special 94RM10FL flasher chassis, only. Chassis has cross-over links between adjacent sockets, only (no main busses). 90CWB6 is installed in card slot A (or C), flasher card in slot B (or D). Flasher connections which normally appear on main bus terminals will appear on customer terminal block A (or C) as follows: FF (TB1), SF (TB2), +24 (TB4), OV (TB5), SH (TB6) and FH (TB7). Up to 10 flashers can be mounted in a 94RM10FL.

## POWER INTERLOCK (90DT, 90DH or 90CFH door operated)

**Model 90DPA***

Requires remote 50-X3/WB3 and a 91JB2 Jumper board in slot C. 90DPA* occupies lower half of lower right corner module (front view). Upper half of module can be utilized as follows:

**90DPA000** No lamps, no card, black 92NP nameplate.

**90DPA111** Single point card, one color sequence, 92NP* nameplate.

**90DPA112** Single point card, two color sequence, 92NP* nameplate.

**90DPA211** Two single point cards, one color sequence, two 94NP* nameplates.

**90DPA221** One twin point card, one color sequence, two 94NP* nameplates.

**90DPA1PL** Used with flasher card with 1PL option, one 92NP1RD "Power-On" nameplate.

## FLASHER AUDIBLE CARDS

**Model 90F*X***

**90F1X1PB** Standard flasher. Has fast flash oscillator output (FF bus), slow flash oscillator output (SF bus), first (alarm) horn enable input (FH bus) which initiates first horn output (flasher term. 7), second (ringback) horn enable input (SH bus) which initiates second horn output (flasher term. 6), and allows for use with pushbutton station.

**90F2** Slave flasher for systems over 300 points. Same as 90F1X1PB except flash oscillators are triggered from FF and SF outputs of 90F1X1PB.

**Options:**

**1DN** Dim lamps in normal. This option *must* be used in Meter Set Analog Systems.

**2H** Alarm horn does not override ringback horn (2 horns on simultaneously).

**1PB1PL** Pushbutton station in lower half of module, power on indication in upper half.
**Note:** 90F* card with 1PB or 1PB1PL option must be mounted in card slot C or D.

**4PL** If flasher is installed in a module with no pushbutton station (with or without sequence cards) any window in the lightbox can be "power on" indicator. For example, with a 94LA lightbox, 4PL flasher in slot A will light top window, slot B, second window, etc.

## INTEGRAL 24 VDC FILTERS

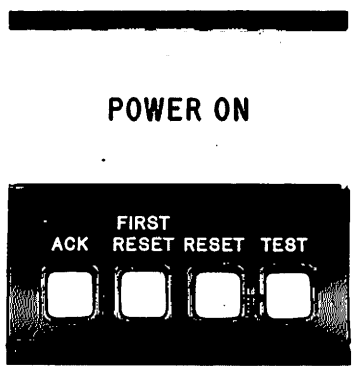
**Model 90FT*** See power supply section.

## INTEGRAL POWER SUPPLIES

**Model 90P*** See power supply section.

## INTEGRAL PUSHBUTTONS

**MODEL 90PB43F1PL** (Illustrated)




**MODEL 90PB**F**

Occupies area equivalent to that of 92NP1 nameplate (lower half of a module position). Remaining portion of module may be used for 1 or 2 active points or a power-on indicator (active points are not available if the pushbutton station is mounted in a module containing an integral power supply). Pushbutton *can only* mount in module positions having 2 or less active points. Normally pushbutton station will mount in front of the module position containing flasher or power supply. If pushbutton station is to mount in a module containing a power supply, replace F designation with P in Model No. If for lamp cabinet, replace F with L. Select Model No. for desired application and insert Option Code No.

| MODEL NO. | DESCRIPTION |
|---|---|
| 90PB11F***WH | 1 Pushbutton—TEST for lamp indicator (LN1). |
| 90PB21F***WH | 2 Pushbuttons—ACK and TEST. For (AF1), (AF5), (MC1), (VA8). |
| 90PB22F***WH | 2 Pushbuttons—ACK and LAMP TEST. For (AF1), (MC1) with 3LT Option (P1 bus). |
| 90PB222F***WH | 2 Pushbuttons—ACK and LAMP TEST. For (AF1), (MC1) with 2LT Option (FT bus). |
| 90PB31F***WH | 3 Pushbuttons—ACK, RESET, and TEST. For (AF3), (AR1), (AS3). |
| 90PB32F***WH | 3 Pushbuttons—ACK, FLASH RESET, and TEST. For (AF2), (AF10). |
| 90PB33F***WH | 3 Pushbuttons—ACK, FIRST RESET, and TEST. For (TF1), (VA1), (VA5). |
| 90PB34F***WH | 3 Pushbuttons—ACK, TEST and LAMP TEST. For (AF1), (AF5), (MC1), (VA8) with 1LT option (P1 bus). |
| 90PB41F***WH | 4 Pushbuttons—ACK, FLASH RESET, RESET and TEST. For (AF4), (AR2). |
| 90PB42F***WH | 4 Pushbuttons—ACK, FLASH RESET, FIRST RESET, TEST. For (TF2), (VA2). |

**90PB43F***WH** 4 Pushbuttons—ACK, FIRST RESET, RESET, and TEST. For (TF3), (VA3), (VR1).

**90PB44F***WH** 4 Pushbuttons—ACK, RETURN ACK, RESET and TEST. For (AR6).

**90PB45F***WH** 4 Pushbuttons—ACK, FLASH RESET, TEST and LAMP TEST. For (AF2) with 1LT Option.

**90PB51F***WH** 5 Pushbuttons—ACK, FLASH RESET, FIRST RESET, RESET and TEST. For (TF4), (VA4), (VR2).

**90PB52F***WH** 5 Pushbuttons—ACK, FLASH RESET, RETURN ACK, RESET and TEST. For (AR7).

**90PB53F***WH** 5 Pushbuttons—ACK, FIRST RESET, RETURN ACK, RESET and TEST. For (VR6).

**90PB61F***WH** 6 Pushbuttons—ACK, FLASH RESET, FIRST RESET, RETURN ACK, RESET, TEST. For (VR7).

***Insert Option Code No.**

| | Option Code | Active Points | |
|---|---|---|---|
| For Models 90PB**F or 90PB**L only | 111 | For 1 active point, single point card, 1-color seq. [2.W]. | See notes |
| | 112 | For 1 active point, single point card, 2-color seq. [2.W]. | |
| | 211 | For 2 active points, single point cards, 1-color seq. [4.W]. | |
| | 221 | For 2 active points, twinpoint card, 1-color seq. [4.W]. | |
| | 000 | No active points or power-on indication | |
| | 1PL | For one power-on light (red nameplate, omit WH suffix) [2.W] | |
| Model 90PB**P only | 2PL | For two power-on lights, primary and backup source, (red nameplates, omit WH suffix). For use with 90P3 power supplies only [4.W]. | |

**Notes:**

1. With Model 90PB**F, either a flasher card (with 1PB or 1PB1PL option), an integral filter (with 1PB or 1PB1PL option) or a jumper card (91JB6) must be located in card slot C or D.
2. For option codes 111, 112 or 221, sequence card must be located in card slot A. For option code 211, sequence cards must be located in slots A and B.

## INTEGRAL HORN

**Model 90PD***

**90PDA1** occupies one module of annunciator cabinet. Steady 2900 Hz tone.

**90PDA3** occupies one module of annunciator cabinet. Fast Pulsing 2900 Hz tone.

**90PDL1** occupies one module of lamp cabinet. Steady 2900 Hz tone.

**90PDL3** occupies one module of lamp cabinet. Fast Pulsing 2900 Hz tone.

## INPUT REFLASH CARDS

**MODEL 90RF*** Input Reflash

Input reflash cards accept multiple field signal inputs and convert them to a common reflash output to a single remote annunciator point.

Different versions will accept dry contact inputs or optical isolated inputs and provide electronic outputs at various voltage levels or a dry contact output.

**90RF1** Four "NL" type contact inputs. One electronic reflash output.

**90RF2** Four "NL" type contact inputs. Two (one per pair) electronic reflash outputs.

**90RF3** Four "NL" type contact inputs. One form "A" or "B" contact (isolated) reflash output.

**90RF4** Three "KN" (opto isolator) type inputs. One electronic reflash output.

**90RF5** Two "KN" (opto isolator) type inputs. One form "A" or "B" contact (isolated) reflash output.

**90RF6** Two "NL" type contact inputs with one form "A" or "B" *contact follower* for each input and one common electronic reflash output.

**MODEL NUMBER STRUCTURE**

**90RF X**

① ② ③ ④ ⑤ ⑥ ⑦

① Variation Code (See above descriptions)

② Place Holder

③ Input Voltage
24DC, 48DC, 125DC for 90RF1, 2, 3 or 6
5V, 12V, 24V, 48V (AC/DC), 120AC, 125DC for 9RF4 or 5

④ Output Voltage (90RF1, 2, 4 or 6)
24DC, 48DC, 125DC

⑤ Relay Contact Configuration (Relay deenergized)
1A (normally open) or 1B (normally closed) for 90RF3 or 5
2A (normally open) or 2B (normally closed) for 90RF6

⑥ Add "E" for sealed relay (See NOTE)

⑦ 1NB no bus connection for 90RF1 or 2, only.
Without this option, FC feed to card may be via either (P3 bus) or customer terminal (TB5). With option, via (TB5), only.

**NOTE** Standard relay contact ratings: 5A up to 250 VAC or 24 VDC sealed contact relay ratings: 3A up to 250 VAC or 24 VDC

## OUTPUT REFLASH CARDS

Accepts inputs from groups of sequence cards and produces a common reflash contact output. May be located in any available card slot.

**MODEL NUMBER STRUCTURE**

**90RFR X17FTD1C**

- Add **"E"** for sealed relay
  Unsealed form C output relay.
- **F** (Standard) fixed output pulse duration.
  **A** (Optional) adjustable pulse duration.
- Standard (100 mS) reflash pulse duration. Other options (20 mS to 500 Sec.) available.
- **1**—Use one per reflash group in the same cabinet. Sequence cards must have **"E"** and **"FHC"** outputs.
  **2**—Use when entire cabinet is to be reflashed. Sequence cards must have **"E"** outputs.

## DUMMY LAMP CARDS

**Model 91DL***

Accepts 120 VAC or DC input with 24V, 80 ma. output.

**91DL1T120V** 120 V input lights the pair of lamps in one window (or window section) of lightbox, depending on which card slot it is mounted in. No card can be installed in the adjacent card slot to the right of the 90DL* card.

**91DL2T120V** 120 V input provides 80 ma @ 24 V to customer terminals (TB6 & 7). No card can be installed in the adjacent card slot to the right of the 90DL* card.

## JUMPER BOARDS

**Model 91JB*.** Each board occupies one position (card slot).

**91JB1** For status lamps, Switch 0V to TB7 of 1 card for 91LA1, 2 for 92LA1, 3 for 93LA1, 4 for 94LA1.

**91JB3** Same as 91JB1 except isolated lamp inputs to TB6 and 7.

**91JB5** Jumpers TB1 through TB7. Connect FC to one terminal and gain 6 more FC terminals.

**91JB6** Connects 90PB**F pushbuttons to busses in lieu of flasher or PSU. Add 1LT and/or 1PL options, if required.

**91JB7** For 2 remote status lamps. With test diodes to P1 bus.

**91JB8** For 4 remote status lamps. With test diodes to P1 bus.

**91JB13** For status lamps in 94LA4 lightbox. Card in slot A. Switch 0V to TB4, 5, 6 or 7 for top, second, third or fourth lamps respectively.

**91JB15** Same as 91JB1 except isolated lamp inputs to TB5 and 6.

**92JB2** For status lamps, Switch 0V to TB6 or TB7 of 1 card for 92LA3, 2 for 94LA3, 3 for 96LA3, 4 for 98LA3 or 94LA9.

**92JB4** Same as 92JB2 except isolated lamp inputs to TB4 and 5 and to TB6 and 7.

# SERIES90 Power Supplies, Filters, Transfer Units

All Series 90 power supplies are load rated and designed to provide continuous reliable system operation. In addition, Series 90 provides interfacing units for redundant or back-up systems if required. Power cross-over, bumpless transfer, and diode ORing techniques may be used. Integral or remote 24VDC filters are available for input direct from 24VDC in lieu of a power supply.

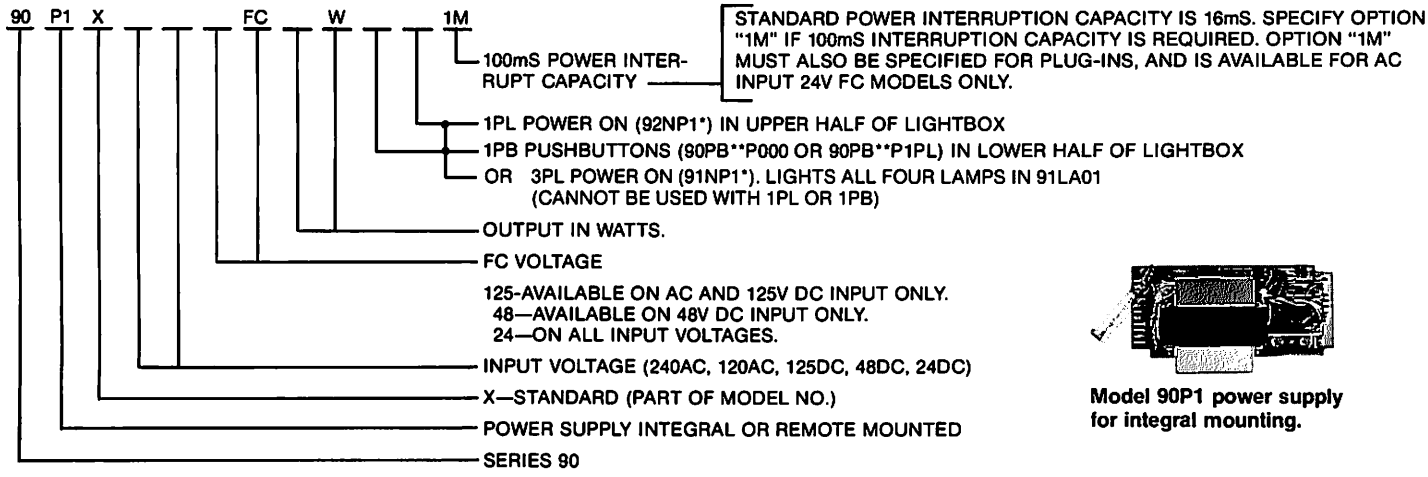
## Model 90P1 Power Supply

| MODEL NUMBER | (W) WATTAGE | INPUT VOLTAGE (*) | | | (A) CURRENT | | | +24 OUTPUT VOLTAGE (VDC) | | | (A) CURRENT | | FC OUTPUT VOLTAGE (VDC) | | | (MA) CURRENT | FUSES (NOTE 6) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NOM | MIN | NOM | MAX | NOM | MAX | | MIN | NOM | MAX | NOM | MAX | MIN | NOM | MAX | NOM | F1 INPUT | F2 FC |
| 90PIX120AC24FC80W | 80 | 105 VAC | 117 VAC | 130 VAC | .9 | 1.0 | | 21.5 | 25.5 | 29.6 | 3.2 | 3.6 | 21.0 | 24 | 29.0 | 75 | 1-1/2A S.B. | 1/4A |
| 90PIX120ACI25FC80W | 80 | 105 VAC | 117 VAC | 130 VAC | .9 | 1.0 | | 21.5 | 25.5 | 29.6 | 3.2 | 3.6 | 105 | 125 | 145 | 75 | 1-1/2A S.B. | 1/4A |
| 90PIX240AC24FC80W | 80 | 210 VAC | 234 VAC | 260 VAC | .45 | 0.5 | | 21.5 | 25.5 | 29.6 | 3.2 | 3.6 | 21.0 | 24 | 29.0 | 75 | 3/4A S.B. | 1/4A |
| 90PIX240ACI25FC80W | 80 | 210 VAC | 234 VAC | 260 VAC | .45 | 0.5 | | 21.5 | 25.5 | 29.6 | 3.2 | 3.6 | 105 | 125 | 145 | 75 | 3/4A S.B. | 1/4A |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| 90PIX24DC24FC90W | 90 | 20 VDC | 24 VDC | 32 VDC | 5.3 | 6.3 | | 25.0 | 25.5 | 26.0 | 3.6 | 3.7 | 22 | 24 | 26 | 100 | 10A | 1/4A |
| 90PIX48DC24FCI00W | 100 | 40 VDC | 48 VDC | 64 VDC | 2.6 | 3.1 | | 25.0 | 25.5 | 26.0 | 4.0 | 4.2 | 22 | 24 | 26 | 100 | 8A | 1/4A |
| 90PIX48DC48FCI00W | 100 | 40 VDC | 48 VDC | 64 VDC | 2.6 | 3.1 | | 25.0 | 25.5 | 26.0 | 4.0 | 4.2 | 45 | 48 | 51 | 100 | 8A | ** |
| 90PIX125DC24FC80W | 80 | 105 VDC | 125 VDC | 140 VDC | 1.2 | 1.5 | | 25.0 | 25.5 | 26.0 | 3.1 | 3.2 | 22 | 24 | 26 | 100 | 3A | 1/4A |
| 90PIX125DCI25FC80W | 80 | 105 VDC | 125 VDC | 140 VDC | 1.2 | 1.5 | | 25.0 | 25.5 | 26.0 | 3.1 | 3.2 | 120 | 125 | 130 | 100 | 3A | ** |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

(*) ON AC INPUT SUPPLIES, SOURCE FREQUENCY MUST BE BETWEEN 48 AND 62 Hz. ON DC INPUT SUPPLIES, SOURCE RIPPLE CAN NOT EXCEED 20% OF NOMINAL VOLTAGE.

(**) SHORT CIRCUIT PROTECTED, NO FC FUSE REQUIRED.

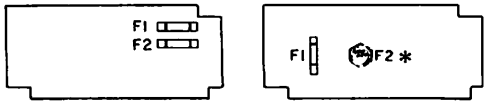
## Model No. Explanation:






**Model 90P1 power supply for integral mounting.**

FUSE PLACEMENT IS APPROXIMATELY AS SHOWN:

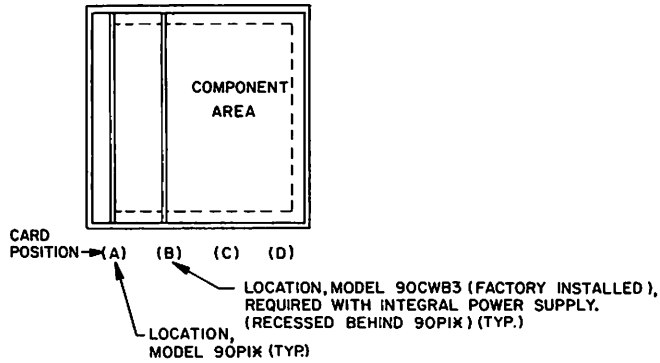



90PIX*AC 90PIX*DC

WEIGHT OF MODEL 90WM1 REMOTE HOUSING (EMPTY) 2.0 kg. (4 lbs., 5 oz.)
WEIGHT OF MODULE 90PIX*AC IS 1.7 kg. (3 lbs., 8 oz.)
WEIGHT OF MODULE 90PIX*DC IS 0.9 kg. (1 lbs., 13 oz.)
THE MODEL 90P1 POWER SUPPLY WHEN INTEGRALLY MOUNTED, REQUIRES ONE FULL MODULE POSITION.

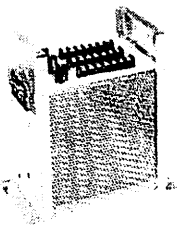
*F2 USED ON DC INPUT 24FC UNITS ONLY.

MODEL 94 STYLE




MODEL 90P1 POWER SUPPLY, INTEGRAL MOUNTED OR REMOTE MOUNTED IN MODEL 90WM1P1 HOUSING (SHOWN WITH NAMEPLATE(S) REMOVED)

# SERIES90

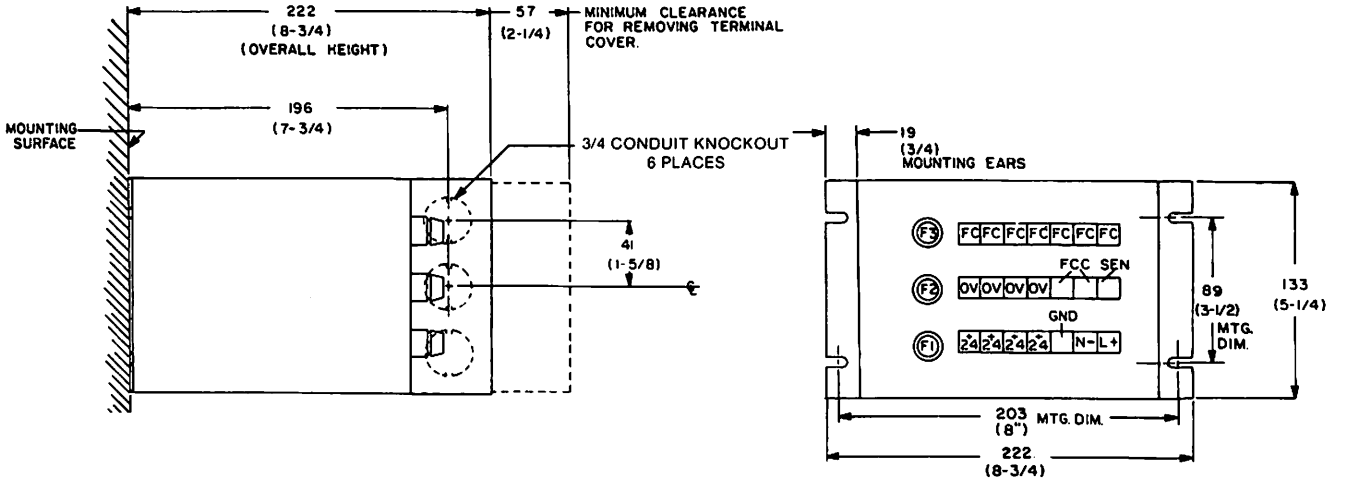


**Model 90P2X power supply for remote mounting.**

## Model 90P2 Power Supply
(For Remote Mounting)

| MODEL NUMBER | WATTAGE * | INPUT VOLTAGE ** MIN | NOM | MAX | CURRENT (A) NOM | MAX | (***) INRUSH CURRENT (A) | TIME ms | +24 OUTPUT VOLTAGE (DC) MIN | NOM | MAX | CURRENT (A) NOM | MAX | FC OUTPUT VOLTAGE (DC) MIN | NOM | MAX | CURRENT (MA) NOM | FUSES F1 INPUT | F2 +24 | F3 FC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90P2X120AC24FC450W | 450 | 105 VAC | 117 VAC | 130 VAC | 4.8 | 5.5 | 134 | 8 | 22.5 | 25.5 | 28.9 | 18 | 19.5 | 21 | 24 | 27.5 | 400 | 7A S.B. | 20A | 1A |
| 90P2X120AC125FC450W | 450 | 105 VAC | 117 VAC | 130 VAC | 5.1 | 6.0 | 134 | 8 | 22.5 | 25.5 | 28.9 | 18 | 19.5 | 107 | 125 | 143 | 400 | 7A S.B. | 20A | 1A |
| 90P2X240AC24FC450W | 450 | 210 VAC | 234 VAC | 260 VAC | 2.4 | 2.8 | 40 | 6 | 22.5 | 25.5 | 28.9 | 18 | 19.5 | 21 | 24 | 27.5 | 400 | 4.0A S.B. | 20A | 1A |
| 90P2X240AC125FC450W | 450 | 210 VAC | 234 VAC | 260 VAC | 2.6 | 3.0 | 40 | 5 | 22.5 | 25.5 | 28.9 | 18 | 19.5 | 107 | 125 | 143 | 400 | 4.0 A S.B. | 20A | 1A |
| 90P2X120AC48FC450W | 450 | 105 VAC | 117 VAC | 130 VAC | 4.8 | 5.6 | 134 | 8 | 22.5 | 25.5 | 28.9 | 18 | 19.5 | 48 | 50 | 55 | 400 | 7A S.B. | 20A | 1A |
| 90P2X240AC48FC450W | 450 | 210 VAC | 234 VAC | 260 VAC | 2.4 | 2.8 | 40 | 5 | 22.5 | 25.5 | 28.9 | 18 | 19.5 | 48 | 50 | 55 | 400 | 4.0 A S.B. | 20A | 1A |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

* WATTAGE RATING IS BASED ON NOMINAL LINE VOLTAGE.
** THE SOURCE FREQUENCY MUST BE BETWEEN 48 & 62 Hz.
*** INRUSH WAS AT HIGH LINE FULL LOAD.




### MODEL NO. EXPLANATION

90 P2X — AC — FC 450W IM

- IM — 100mS POWER INTERRUPT CAPACITY
- 450W — OUTPUT IN WATTS
- FC — FC VOLTAGE
  - 125 AVAILABLE ON ALL INPUT VOLTAGES.
  - 48 AVAILABLE ON ALL INPUT VOLTAGES.
  - 24 AVAILABLE ON ALL INPUT VOLTAGES.
- AC — INPUT VOLTAGE (240 AC, 120AC)
- P2X — REMOTE MOUNTING POWER SUPPLY
- 90 — SERIES 90

STANDARD POWER INTERRUPTION CAPACITY IS 16mS. SPECIFY OPTION "1M" IF 100mS INTERRUPTION CAPACITY IS REQUIRED. OPTION "1M" MUST ALSO BE SPECIFIED FOR PLUG-INS, AND IS AVAILABLE FOR AC INPUT 24V FC MODELS ONLY.

NOTES:

1. THE 90P2X*AC*FC450W WEIGHS 12.9 kg (28 lbs, 6 oz.)
2. OPERATING TEMPERATURE 0°C TO 50°C.

# SERIES90 Model 90P3 Power Supply With Model 90PT1 Power Transfer

POWER SUPPLY RATING.

| MODEL NUMBER | (W) WATTAGE | (VAC) INPUT VOLTAGE (*) | | | (A) INPUT CURRENT | | | +24 OUTPUT VOLTAGE (VDC) | | | (A) +24 OUTPUT CURRENT | | FC OUTPUT VOLTAGE (VDC) | | | (MA) FC CURRENT | FUSES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | F1 | F2 | FIA |
| | NOM | MIN | NOM | MAX | NOM | MAX | | MIN | NOM | MAX | NOM | MAX | MIN | NOM | MAX | NOM | INPUT | FC | 24V.AUX |
| 90P3X120AC24FC80W | 80 | 105 VAC | 117 VAC | 130 VAC | .9 | LO | | 21.5 | 25.5 | 29.6 | 3.2 | 3.6 | 21.0 | 24 | 29.0 | 75 | 1-1/2A S.B. | 1/4A | 5A |
| 90P3X120AC25FC80W | 80 | 105 VAC | 117 VAC | 130 VAC | .9 | LO | | 21.5 | 25.5 | 29.6 | 3.2 | 3.6 | 105 | 125 | 145 | 75 | 1-1/2A S.B. | 1/4A | 5A |
| 90P3X240AC24FC80W | 80 | 210 VAC | 234 VAC | 260 VAC | .45 | 0.5 | | 21.5 | 25.5 | 29.6 | 3.2 | 3.6 | 21.0 | 24 | 29.0 | 75 | 3/4A S.B. | 1/4A | 5A |
| 90P3X240AC25FC80W | 80 | 210 VAC | 234 VAC | 260 VAC | .45 | 0.5 | | 21.5 | 25.5 | 29.6 | 3.2 | 3.6 | 105 | 125 | 145 | 75 | 3/4A S.B. | 1/4A | 5A |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

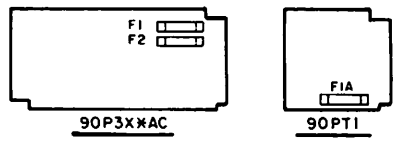
* THE SOURCE FREQUENCY MUST BE BETWEEN 48 AND 62 Hz

## Model No. Explanation: Power Supply

90 P 3 X AC FC 80 W 1M

- 1M — 100mS POWER INTERRUPT CAPACITY — STANDARD POWER INTERRUPTION CAPACITY IS 16mS. SPECIFY OPTION "1M" IF 100mS INTERRUPTION CAPACITY IS REQUIRED. OPTION "1M" MUST ALSO BE SPECIFIED FOR PLUG-INS, AND IS AVAILABLE FOR AC INPUT 24V FC MODELS ONLY.
- 5PL—MAIN POWER ON (92NP1*) IN UPPER HALF OF LIGHTBOX, AUXILIARY POWER ON (92PN1*) IN LOWER HALF
- 1PB—PUSHBUTTONS (90PB**P000) IN LOWER HALF OF LIGHTBOX
  92NP1BK BLACK NAMEPLATE IN UPPER HALF
  NOTE: COMBINATION (1PB2PL) PROVIDES PUSHBUTTONS IN LOWER HALF AND TWO 94NP1* (AUX. AND MAIN POWER) IN UPPER HALF
- 80W — OUTPUT IN WATTS
- FC — FC VOLT 24 OR 125 VDC
- AC — INPUT VOLTAGE (240AC, 120AC)
- X — X—STANDARD (PART OF MODEL NO.)
- P3 — INTEGRAL MTG. FOR USE WITH 90PT1
- P — POWER SUPPLY
- 90 — SERIES 90

FUSE PLACEMENT APPROXIMATELY AS SHOWN




## Model No. Explanation: Power Transfer

90PT I X *FC *

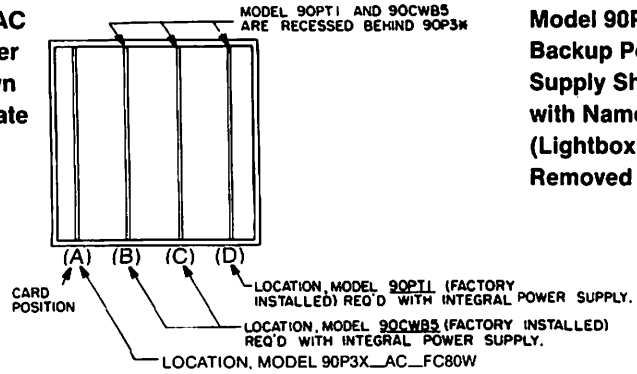
- * — LINE MONITORING OPTION- ILM
- *FC — FC VOLT 24 or 125 VDC
- X — VARIATION
  I—INTEGRAL (FOR USE WITH P3 SUPPLY)
- I — SERIES 90 POWER TRANSFER
- 90PT — SERIES 90 POWER TRANSFER

WEIGHT OF MODEL 90WM1 REMOTE HOUSING (EMPTY) 2.0 kg. (4 lbs., 5 oz.)
WEIGHT OF MODULE 90P3* IS 1.7 kg. (3 lbs., 8 oz.)

THE MODEL 90P3* POWER SUPPLY WITH 90PT1 POWER TRANSFER, WHEN INTEGRALLY MOUNTED, REQUIRES ONE FULL MODULE POSITION.

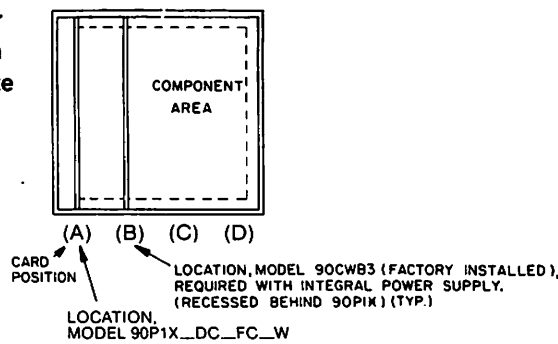
## 90P3 Primary Power Supply and 90P1 Backup Power Supply with Model 90PT1 Power Transfer

**Model 90P3 AC Primary Power Supply Shown with Nameplate (Lightbox) Removed**




MAY BE MOUNTED INTEGRALLY OR REMOTE MOUNTED IN 90WM1P3 HOUSING.

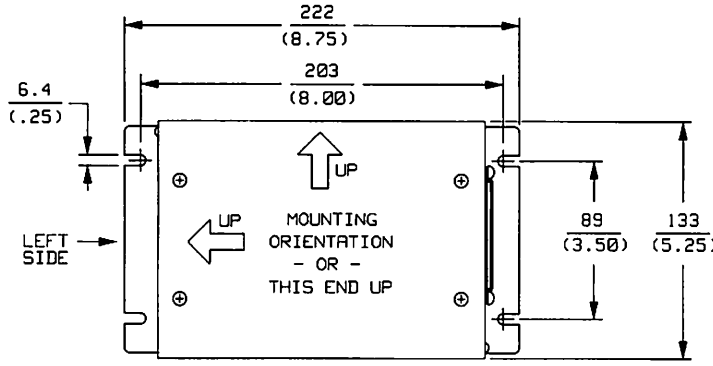
**Model 90P1 DC Backup Power Supply Shown with Nameplate (Lightbox) Removed**



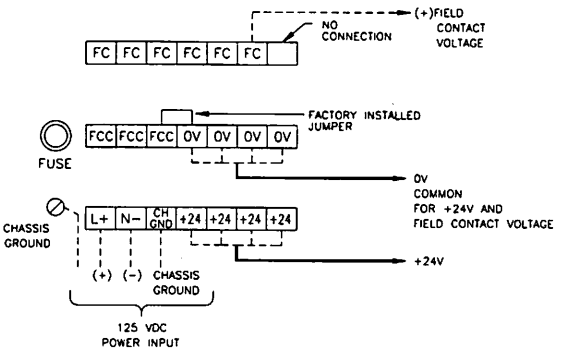

MAY BE MOUNTED INTEGRALLY OR REMOTE MOUNTED IN 90WM1P1 HOUSING

# SERIES90 Model 90P18 DC/DC Converter

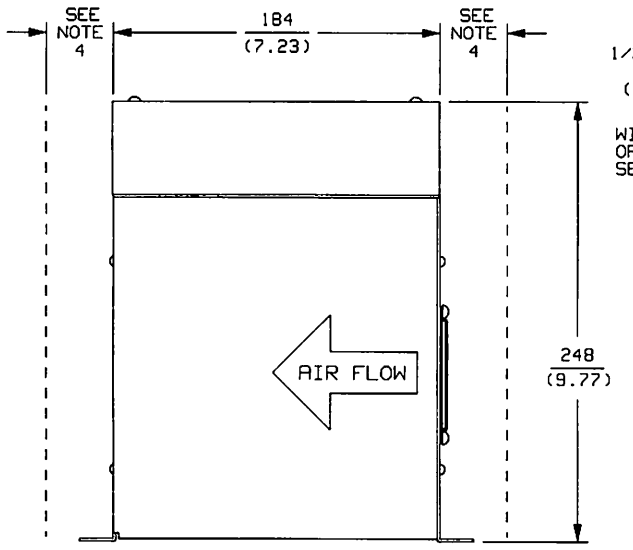
(For Remote Mounting) 450 Watts



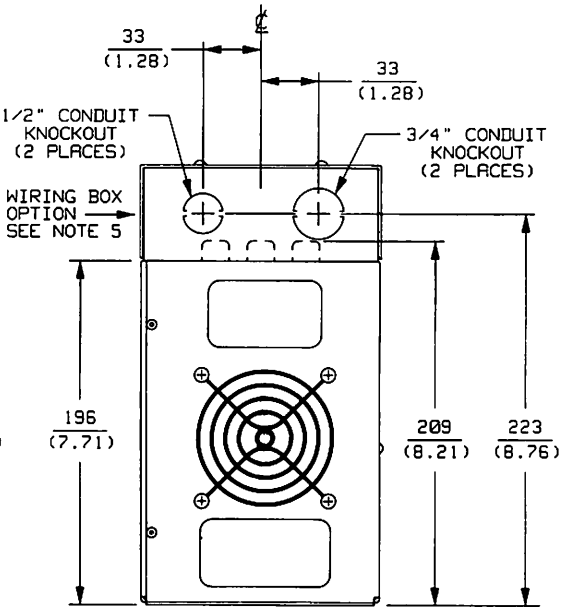

TOP VIEW - WIRING BOX OPTION




WIRING FOR NON-ISOLATED FIELD CONTACT




FRONT VIEW




RIGHT SIDE VIEW

PARENT ITEM NUMBER — 90P18

SERIES 90 REMOTE DC CONVERTER

VARIATION CODE
X = STANDARD

INPUT VOLTAGE
6D = 125VDC

CABINET VARIATION CODE
1C = NEMA 1 ENCLOSURE WITH WIRING BOX
2C = NEMA 1 ENCLOSURE, WITHOUT WIRING BOX

FC VOLTAGE
4D = 24VDC
6D = 125VDC

POWER TRANSFER OPTION
1PT = POWER TRANSFER

NOTES:

1. WEIGHT APPROX. 3.6Kg. (7lbs. 15oz.).
2. OPERATING TEMPERATURE 0° - 50°C.
3. MATERIAL: .036(20GA)CRS
   FINISH: ZINC PLATE
4. A 38(1.5) FREE AIR CLEARANCE MUST BE MAINTAINED FROM FAN AND VENT SIDES TO ENSURE ADEQUATE COOLING.
5. FOR MODELS WITHOUT WIRING BOX OPTION (2C) OVER ALL HEIGHT IS 209 (8.21).

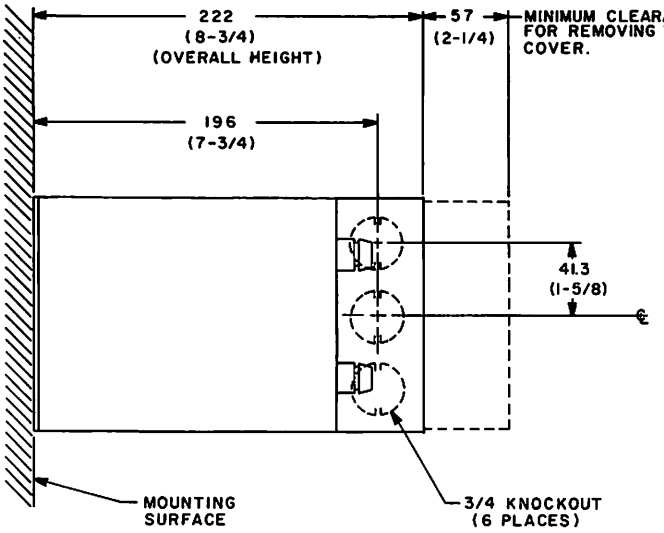
FUSE: 5.0 AMP

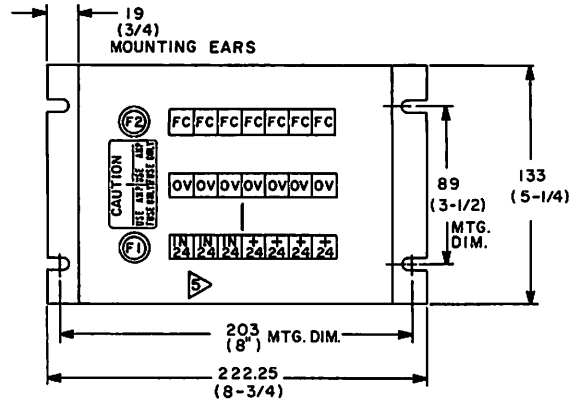
MAX: 4.3 AMP

105-140 VAC MAX 10% RIPPLE

# SERIES90 Model 90FT2 Power Filter
(For Remote Mounting)

| MODEL NUMBER | WATTAGE | INPUT VOLTAGE | | CURRENT (A) | +24 OUTPUT VOLTAGE (DC) | | CURRENT (A) | FC OUTPUT VOLTAGE (DC) | | CURRENT (MA) | FUSES | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NOM. | MAX. | MAX. | NOM. | MAX. | | NOM. | MAX. | MAX. | F1 INPUT | F2 FC |
| 90FT2X24DC24FC500W | 500 | 24 | 32 | 20A | 24 | 32 | 19 | 24 | 32 | 1000 | 20A | 1AMP |




**MODEL NUMBER EXPLANATION:**

90 FT2 X 24DC 24FC 500W

- 500W — OUTPUT IN WATTS
- 24FC — FC VOLTAGE 24V
- 24DC — INPUT VOLTAGE (24VDC)
- X — (X), PLACE HOLDER
- FT2 — REMOTE MOUNTING INPUT FILTER
- 90 — SERIES 90

**NOTES:**
1. WEIGHT 2.3 Kg (5 lbs.).
2. OPERATING TEMPERATURE 0°C to 50°C.
3. INPUT REVERSED POLARITY PROTECTED.
4. MAX. DC INPUT RIPPLE SHALL NOT EXCEED 20%.

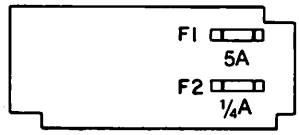
# Model 90FT3 Power Filter (For Integral Mounting)

**MODEL NUMBER EXPLANATION:**

90 FT 3 X * * 24FC 125W

- 125W — OUTPUT IN WATTS
- 24FC — FC VOLTAGE (24V AVAILABLE ONLY)
- * — 1PL (OPTIONAL) WIRED FOR "POWER ON" LAMPS
- * — 1PB (OPTIONAL) WIRED FOR PUSHBUTTON ASSEMBLY
  1LT (OPTIONAL) REQUIRED FOR PUSHBUTTON ASSEMBLIES WITH LAMP TEST PUSHBUTTON
- X — PLACE HOLDER
- 3 — INTEGRAL
- FT — FILTER
- 90 — SERIES 90

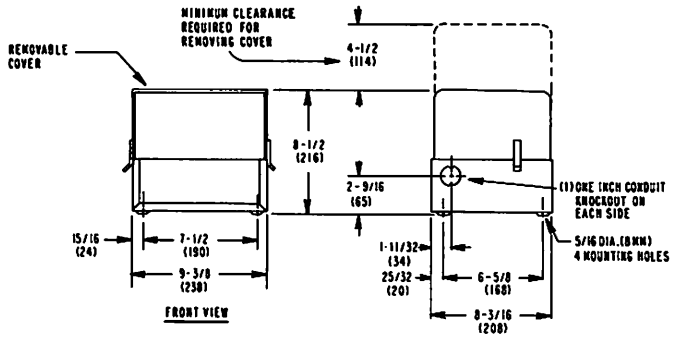
**NOTES:**
1. VOLTAGE TO FIELD CONTACTS IS NOT ISOLATED FROM SYSTEM SUPPLY BUT IS FUSED SEPARATELY.
2. THE "90FT3" HAS A CAPACITY OF 5A AT 24 VDC NOM (125W).
3. L.E.D. STATUS INDICATORS FOR INDICATION OF FC AND +24V FUSE STATUS.
4. INPUT REVERSED POLARITY PROTECTED.
5. WHEN USED WITH 1PB, 1LT OR 1PL OPTIONS, THE '90FT3' CAN ONLY BE USED IN CARD POSITIONS "C" OR "D".



# Model 90BT* Bumpless Power Transfer (For Remote Mounting)

The 90BT__ diode gates outputs of either two DC input power supplies or two in-phase (or 180° out-of-phase) AC input power supplies such that should either supply fail, the other will assume the load without system malfunction.

If an AC input primary power supply and DC input backup power supply combination is required, use the 90PT1 (described on page 38) or the 90PT2 (described below) power transfer unit. The 90PT2 can also be used with two out-of-phase AC input power supplies.




# Model 90BT1*
(Non-Isolated FC Voltage)

Model 90BT1* is equipped with 2 relay sockets, mounted and wired for optional model 90AX2 power failure monitor relays. Relay is energized in normal. If logic voltage (+24) or field contact voltage (FC) fail, relay will de-energize. Each 90AX2 has (2) Form "C" contacts rated at 5 amp resistive at 28VDC or 120VAC and 0.5 amp at 125VAC.

**MODEL NO. EXPLANATION:**

90 BT 1 X 24DC FC

- FC VOLTAGE 24VDC OR 125VDC
- LOGIC VOLTAGE
- PLACE HOLDER
- GENERIC NO. (FOR NON-ISOLATED F.C.)
- BUMPLESS TRANSFER
- SERIES 90

# Model 90BT2* (Isolated FC Voltage)

Model 90BT2* is equipped with 2 relay sockets, mounted and wired for optional Mod. 50-X20-24/24 PWR. Failure monitor relays. Relay is energized in normal. If logic voltage (+24) or field contact voltage (FC) fail, relay will de-energize. Each 50-X20-24/24 has (1) Form "C" contact per relay rated at 2 amp resistive at 30VDC or 120VAC/250VAC. and .25A at 125VDC.

**MODEL NO. EXPLANATION:**

90 BT 2 X 24DC 24FC

- FC VOLTAGE
- LOGIC VOLTAGE
- PLACE HOLDER
- GENERIC NO. (FOR ISOLATED F.C. VOLTAGE)
- BUMPLESS TRANSFER
- SERIES 90

# Model 90PT2 Power Transfer (For Remote Mounting)

| MODEL NUMBER | WATTAGE | INPUT VOLTAGE | | INPUT CURRENT (A) MAX | OUTPUT VOLTAGE | | OUTPUT CURRENT | OUTPUT CURRENT | FUSES | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | LOGIC | FC | | LOGIC | FC | LOGIC | FC | F1 | F2 |
| 90PT2X24FC450W | 450 | 24 | 24 | 20 | 24 | 24 | 19.6A | 0.4A | 20A | 1A |
| 90PT2X125FC450W | 450 | 24 | 125 | 20 | 24 | 125 | 19.6A | 0.4A | 20A | 1A |

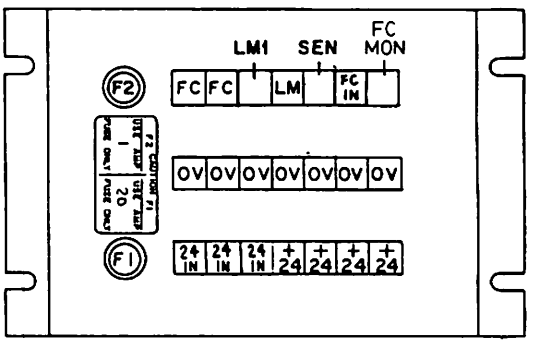
NOTES:

1. The 90PT2XFC450W weighs 3.29Kg. (7.25 lbs.).
2. Operating temperature 0°C to 50°C.
3. FC input must be filtered DC voltage, (max. 5% ripple)
4. LM1 terminal is for indication that back-up power is on line.
5. LM terminal is for indication of loss of primary power.
6. The 90PT2 can be used with either isolated or non-isolated FC systems.
7. Both +24 and FC are fused.
8. Power transfer (Relay/transistor switching) is less than 16 mS and provides complete isolation of power supply outputs, allowing the use of any combination of power supply inputs (AC-DC, DC-DC or AC-AC, from in-phase or out-of-phase sources). Annunciator power will not be lost during transfer.
9. Power transfer will occur only if power supply input source power fails. It will not transfer on +24 or FC fuse failure since transfer would likely cause backup fuse failure also. Therefore, it is important that two Model 90AX2/WB3 power failure monitors be wired into the system, one to monitor + 24 and FC outputs (including fuses) of the primary supply and one to monitor outputs of the backup supply.
10. Dimensional outlines are identical to those shown for the 90FT2 Power Filter on facing page.

MODEL NO. EXPLANATION

90 PT 2 X FC 450W

- WATTAGE
- FC VOLTAGE (DC), 24 OR 125
- (X), PLACE HOLDER
- REMOTE MOUNTING
- POWER TRANSFER
- SERIES 90



# SERIES90 Ordering Information

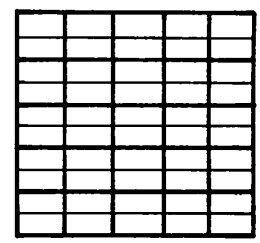
## To Order INTEGRAL Annunciator System

1. Select the flush mount cabinet size required. List the number of cabinets required by Model Number type and complete the Model Number with the number of lightbox rows high and lightbox rows (columns) wide for each cabinet. It is recommended that an "ORDERING MATRIX" (see Page 48) be used.
2. Select the quantity and type of lightboxes required for each cabinet. The number of sequence cards and type (single or twinpoint card) required for each cabinet module position will determine the model lightbox required. There are eight lightbox styles available depending on usage with single or two color sequences and single or twinpoint sequence cards. See Pages 12 & 13.
3. Select one flasher/audible card for each cabinet or each group of cabinets to be wired as a single system. Each flasher is capable of operating up to 300 sequence card points. Model 90F1X1PB is the standard F/A card. See Page 34 for slave flasher/audible card and options.
4. Select the quantity and type of sequence cards required. See Pages 14 & 15.
5. If other than the standard sequence card is required, select the input and output features required and add the option code designations to the sequence card model numbers. See Pages 20 through 23.
6. Select the power supply. Pages 36 through 41 describe power supplies for integral or remote mounting. Size the total system load and the power supply(s) required for input and total load (see Pages 46 & 47). If 24VDC is the primary input, and isolation is not required, select a 90FT* filter in lieu of a power supply.
7. Select integral or remote pushbuttons. Integral pushbuttons occupy lower half of a cabinet module position. Pages 34 & 35.
8. Select audible devices and/or common auxiliary relay and mounting boxes as required. Page 33.
9. If required, NEMA 12 and NEMA 4 surface mount enclosures are also available, (see page 7) or select an enclosure or door as shown on Page 8. Special enclosures and doors are also available. Consult your PANALARM Representative or the Factory.
10. List nameplate engraving information.

## Ordering Examples

### Example #1 (Integral)

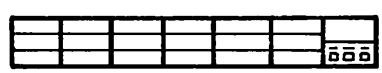
System Description—50 points, nameplates 1½" x 3" (approx.). Basic flashing sequence, remote power supply, common auxiliary contact for 120V audible, 120V 50-60 Hz input, 24VDC Signal Contact Voltage. Remote pushbuttons. (Future expansion to double system size *not* required).



| Qty. | Model No. | Component Description | | *Load (Watts) |
|---|---|---|---|---|
| 1 | 94CA55 | Annunciator Cabinet, 5 module rows high x 5 module rows wide. | | |
| 25 | 92LA01 | Dual window light boxes. | | 100W |
| 50 | 92NP1WH | White nameplates for dual point light boxes. | | |
| 1 | 90F1X1PB | Flasher/Audible output card (Pos. 5-5D) | | 1.5W |
| 50 | 91AF1T24DC | Sequence AF Cards for 24VDC signal contact voltage (all card slots A and C). | | 48.6W |
| 1 | 90P2X120AC24FC450W | Remote 120VAC 50-60 Hz power supply with 24VDC signal contact voltage. | 450W | |
| 2 | SW-102 | Remote Mounting Pushbuttons one for ACK, one for TEST. | | |
| 1 | 90AX1 | Common Auxiliary Relay with three SPDT contacts. | | 1.5W |
| 1 | WB-3 | Relay Mounting Box. | | |
| 1 | HSA 120AC 50-60 Hz | Remote Horn | | |
| Nameplate engraving as per customer supplied list.<br>*Extended component loads for power supply sizing. | | | System Load (Watts): | 151.6W |

### Example #2 (Integral)

System Description—18 points, nameplates 1" x 3" (approx.). First-out manual reset sequence, SPDT auxiliary contact per point, integral pushbuttons, 125VDC input, 24VDC signal contact voltage, integral power supply, and remote audible device.

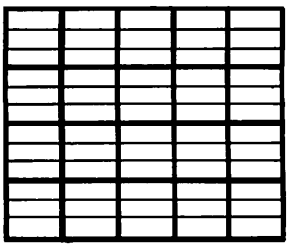


| Qty. | Model No. | Component Description | | *Load (Watts) |
|---|---|---|---|---|
| 1 | 94CA17 | Annunciator Cabinet, 1 module row high x 7 module rows wide. | | |
| 6 | 93LA01 | Lightboxes with tri-window. | | 36W |
| 18 | 93NP1WH | White nameplates for triple point light boxes. | | |
| 1 | 90F1X1PB | Flasher/Audible output card (Pos. 1-6D). | | 1.5W |
| 18 | 91TF3T24DC | Sequence TFSM card for 24VDC signal contact voltage and integral SPDT auxiliary contact (Pos. 1-1A, B, C, through 1-6A, B, C). | | 33.7W |
| 1 | 90P1X125DC24FC80W1PB | Integral 125VDC power supply with 24VDC signal contact voltage, (Pos. 1-7). | 80W | |
| 1 | 90PB43P1PL | Integral Pushbutton station, ACK, FIRST RESET, RESET and TEST, with power-on light (Pos. 1-7). | | 2.0W |
| 1 | NT2-24D | Novatone Multitone audible. | | 2.4W |
| Nameplate engraving as per customer supplied list.<br>*Extended component loads for power supply sizing. | | | System Load (Watts) | 75.6W |

## Example #3 (Tri-Point Integral Only)

See Bulletin 93 for details

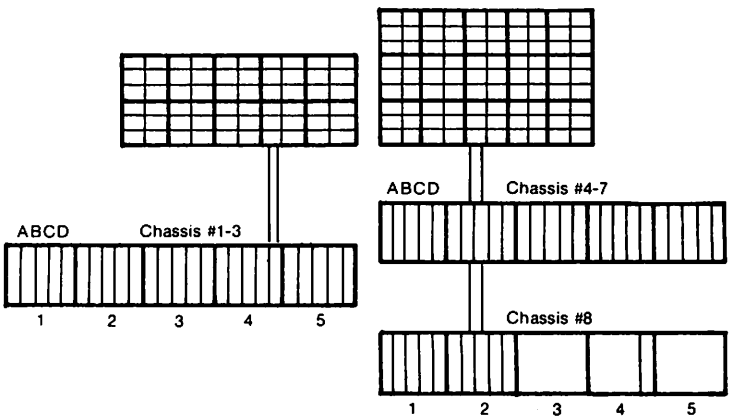
System Description—60 points, nameplates 1" x 3" (approx.). Multiple sequence (field selectable), remote power supply, form B auxiliary contact per point, 120V, 50-60 Hz input, 24 VDC signal contact voltage. Remote pushbuttons and remote multitone audible.



| Qty. | Model No. | Component Description | *Load (Watts) |
|---|---|---|---|
| 1 | 94CA45 | Annunciator Cabinet, 4 module rows high x 5 module rows wide. | |
| 20 | 93LA31 | Triple window light boxes. | 120W |
| 60 | 93NP1WH | White nameplates for triple window light boxes. | |
| 1 | 90F1X1PB | Flasher/Audible output card (Pos. 4-5D) | 1.5W |
| 20 | 93MP1X4D | Tri-point multiple sequence cards for 24VDC signal contact voltage (All card slots A). | 80W |
| 20 | 93AXC1B | Tri-point auxiliary relay cards (all card slots B). | 60W |
| 1 | 90P2X120AC24FC450W | Remote 120VAC 50-60 Hz power supply with 24VDC signal contact voltage. 450W | |
| 3 | SW-102 | Remote mounting Pushbuttons for ACK, TEST and RESET. | |
| 1 | NT2-24D | Novatone Multitone audible. | 1.5W |
| Nameplate engraving as per customer supplied list. *Extended component loads for power supply sizing. | | System Load (Watts): | 263.0W |

## To Order REMOTE Annunciator System

1. Select the lamp cabinet required. See Page 11. Model 90CL or 90CLP is the basic model number. Complete the model number by inserting the number of lightbox rows high by lightbox rows wide. (Model 90CLP lamp cabinets require lamp cables. See step 4.)
2. Select the quantity and Model lightboxes required. See Pages 12 & 13. Lightboxes are available for single, dual, triple, quad, hex or octal point indication per lightbox module position.
3. Select the quantity and type of remote logic chassis to satisfy the mounting configuration required. See Pages 10 & 11.
4. For split architecture systems, installation costs can be greatly reduced by using prefabricated cabling from annunciator logic chassis to lamp cabinets (20 points per cable) and, if required, from chassis to signal input terminals and/or to aux. output terminals. After specifying lamp cabinets and remote chassis with MS connectors, determine required cable lengths, and whether straight or elbow type MS connectors are required at cable ends. Then contact your PANALARM representative for specific model numbers.
5. Follow Steps 3 through 10 of the Integral System order procedure.

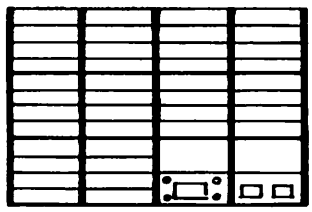



## Example #4 (Remote)

System Description—150 Points, nameplates 1" x 1½" (approx.). Double ringback sequence, separate audible on return to normal. With 150 foot cables for connection of chassis logic to lamp cabinets (one 60 points and one 90 points), 19" rack mounting logic chassis, 120VAC 50-60 Hz input, 125VDC signal contact voltage.

| Qty. | Model No. | Component Description | *Load (Watts) |
|---|---|---|---|
| 1 | 90CLP25M3 | Lamp Cabinet, 2 module rows high x 5 module rows wide with connectors for lamp cables. | |
| 10 | 96LBX01 | Hex Window Lightboxes. | 60W |
| 30 | 96NP1WH | White nameplates for hex point light boxes. | |
| 1 | 90CLP35M5 | Lamp Cabinet, 3 module rows high x 5 module rows wide with connectors for lamp cables. | |
| 15 | 96LBX01 | Hex Window Lightboxes. | 90W |
| 45 | 96NP1WH | White nameplates for hex point light boxes. | |
| 8 | 94RM01LXX0005 (contact factory for specific model numbers) | Rack Chassis, 20 points, with lamp cable connectors. | |
| 8 | 57CBL01Y02Y150N | Lamp Cables with straight connectors, 150 ft. long, non-PVC. | |
| 1 | 90F1X1PB | Flasher/Audible Output Card, mounted in chassis #8, module 4 slot D. | 1.5W |
| 150 | 91AR1T125DC | Sequence ARR Card, 125VDC signal contact voltage. | 251W |
| 1 | 90P2X120AC125FC450W | Power Supply Input 120AC 50-60 Hz., 125DC Field Contact Voltage, Rack mounted. 450W | |
| 2 | NT2-24D | Novatone Multitone Audibles programmable for different tones to provide different audible sounds on alarm and return-to-normal. (16 Field selectable tones). | 4.8W |
| 3 | SW-102 | Remote Mounting Pushbuttons ACK, RESET and TEST. | |
| Nameplate engraving as per customer supplied list. *Extended component loads for power supply sizing. | | System Load (Watts): | 407W |

# SERIES90 Ordering Information



## Example #5 (Meter Set, Integral)

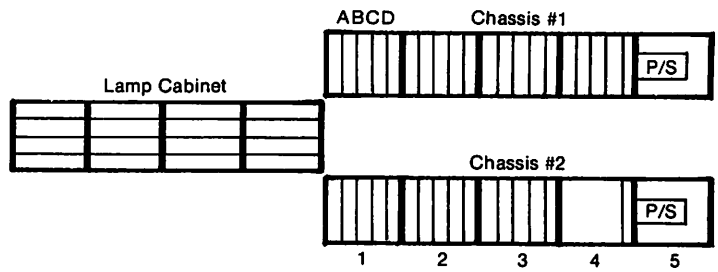
System Description—20 points dual set, thermocouple Type J. Aux contact NC. Input 120VAC. Window size $^{11}/_{16}$" H x $3^{5}/_{16}$" W per indication. Basic flashing sequence AF. Integral pushbuttons.

| Qty. | Model No. | Component Description | *Load (Watts) |
|---|---|---|---|
| 1 | 94CA34 | Integral logic cabinet, 3 module rows high by 4 module columns wide. | |
| 10 | 94LA03 | Quad window light boxes. For dual setpoint indication of two inputs per module position. | 80W |
| 40 | 94NP1WH | White nameplates for quad point light boxes. | |
| 1 | 90F1X1DN1PB1PL | Flasher/Audible Output Card (Position 3-4D) | 2.0W |
| 20 | 92AF1DM12DC4B | Twinpoint sequence card, Sequence AF with integral Form B (SPST) auxiliary contacts per point (all module positions, slots A and C except display and pushbutton positions). | 56W |
| 20 | 91AD2TC1 | Analog input card meter set, Type J thermocouple, dual setpoint (all module positions, slots B and D except display and pushbutton positions). | 50W |
| 20 | 90ATB1 | Cold junction compensator | |
| 1 | 90PB21F1PL | Integral pushbutton station with power on light, ACK and TEST. (position 3-4). | 2.0W |
| | | Digital display (position 3-3) consisting of the following: | |
| 1 | 90 FD1 | Front display | 0.5W |
| 2 | 90CWB2 | Interface boards (slots A and C) | |
| 1 | 90CPX1 | Processing board (slot B) | 6.5W |
| 1 | 90YM1 | Matrix board (slot D) | 2.5W |
| 1 | NT2-24D | Novatone multi tone audible | 2.4W |
| 1 | 90P2X120AC24FC450W | Remote power supply 120V, 50-60 Hz input 450W | |
| 1 | CF1 | Cooling fan 120V, 50-60 Hz, mounted on rear cover | |
| 1 | 90TP2 | Test probe | |
| Nameplate engraving as per customer supplied list. *Extended component loads for power supply sizing. | | System Load (Watts) | 201.9W |

SEE "ORDERING MATRIX", PAGE 48

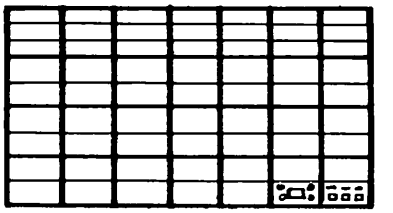
## Example #6 (Blind Set, Remote)

System Description—14 points single setpoint analog input total, comprised of 7 (active) 4-20mA inputs and 7 Thermistor (2252 ohm) inputs. Alarm sequence AR. Window size $^{11}/_{16}$" H x $3^{5}/_{16}$" W (lamp cabinet). Remote chassis to include 120V, 50-60 Hz input power supply. Chassis to be rack mounted with rear access terminals. Remote audibles for alarm and return-to-normal. Remote pushbuttons.




| Qty. | Model No. | Component Description | *Load (Watts) |
|---|---|---|---|
| 1 | 90CL14 | Lamp cabinet. | |
| 4 | 94LBX01 | Quad window light boxes. | 32W |
| 16 | 94NP1WH | White nameplates for quad point light boxes. | |
| 2 | 94RM01 | Rack mounted chassis. | |
| 1 | 90F1X1PB | Flasher/audible card, mounted in Chassis #2 module 4 slot D. | 1.5W |
| 14 | 91AR1DB12DC | Sequence cards, Sequence AR. All slots A and C in modules 1-4 of Chassis #1 and 1-3 of Chassis #2. | 12.6W |
| 7 | 91AB1AXD1 | Blindset analog input cards. Programmable for 0.25 to 1.25V to accept 4 to 20mA input signals. Chassis #1 slots B and D of first three modules and slot B of module 4. | 16.1W |
| 7 | 91ATB9 | Current conversion resistor block 61.9 ohms mounted on rear terminals of slots having 4 to 20mA input signals. | |
| 7 | 91AB1TM5 | Blindset analog input cards for 2252 ohm thermistor Chassis #1 slot D of module #4 and Chassis #2 slots B and D of modules 1, 2 and 3. | 16.1W |
| 2 | 90P1X120AC24FC80W | Power supply 120V 50-60 Hz with 90CWB3 FC jumper board, module 5, each chassis 160W | |
| 3 | SW-102 | Remote pushbuttons ACK, RESET, and TEST. | |
| 2 | NT2-24D | Novatone multi tone audibles for alarm and return-to-normal | 4.8W |
| 1 | 90TP2 | Test probe | |
| Nameplate engraving as per customer supplied list. *Extended component loads for power supply sizing. | | System Load (Watts) | 83.1W |

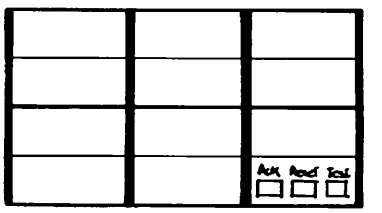
## Example #7 (Meter Set, Integral)



System Description—Ten Type T thermocouple inputs, nine 3-wire 120 ohm Ni RTD inputs, and 21 contact inputs. All points to have SPDT Form A (NO) aux contacts. All analog points will have 1-5V analog outputs. All analog points will be dual setpoint for high/low monitoring. Integral pushbuttons and meter. Remote power supply, 120V 50-60 Hz AC input, field contact voltage 24 DC. Integral digital display meter. Window size for analog points 1 7/16" H x 3 5/16" W per indication. Window size for dry contact input points 15/16" H x 3 5/16" W per indication. Sequence AF analog inputs, Sequence TFS contact inputs. Contact inputs row 1, analog inputs in rows 2, 3, and 4. Thermocouple range 185° to 370°C. RTD range 60° to 180°C. Remote audible.

| Qty. | Model No. | Component Description | *Load (Watts) |
|---|---|---|---|
| 1 | 94CA47 | Integral logic cabinets, 4 module rows high x 7 module columns wide. | |
| 7 | 93LA01 | Tri window light boxes. | 42W |
| 21 | 93NP1WH | White nameplates for triple point light boxes. | |
| 19 | 92LA03 | Dual window light boxes for dual setpoint indication. | 76W |
| 38 | 92NP1WH | White nameplates for dual point light boxes. | |
| 1 | 90F1X1DN1PB1PL | Flasher/audible output card (Pos. 4-7D) | 2W |
| 21 | 91TF1NL24DC4A | Sequence cards, Sequence TFS with integral Form A auxiliary contact. All A, B & C slot positions in row 1. | 30.9W |
| 19 | 92AF1DM12DC4A | Twinpoint sequence cards Sequence AF with integral Form A aux contact (A slots in rows 2, 3 and 4 except positions 4-6 and 4-7) for interface with analog input cards. | 53.2W |
| 10 | 91AD2TC3 | Meter set analog input card, T type thermocouple, dual setpoint and drive output for analog output cards (All B slots row 2 and B slots in positions 3-1, 3-2 and 3-3). | 25W |
| 10 | 90ATB1 | Cold junction compensators for above cards. | |
| 9 | 91AD2R3 | Meter set analog input card, 3-wire 120 ohm Ni, dual setpoint and drive output for analog output cards. All B slots 3-4 through 3-7 and 4-1 through 4-5. | 22.5W |
| 19 | 91AL2 | Analog output card 1-5V, over full monitoring range of input thermocouple or RTD. (All C slots in rows 2, 3 and 4 except positions 4-6 and 4-7.) | 57W |
| 1 | 90B31F1PL | Pushbutton station and power on light ACK, FIRST RESET, and TEST (position 4-7). | 2W |
| | | Digital display and expander cards (positions 4-6 and 4-7, slots A & B) consisting of the following: | |
| 1 | 90FD1 | Front display | 0.5W |
| 1 | 90CPX1 | Processor board, position 4-6B | 6.5W |
| 1 | 90YM1 | Matrix board, position 4-6D | |
| 1 | 90YM2 | Matrix expander board, position 4-7B | 2.5W |
| 3 | 90CWB2 | Interface boards, position 4-6A, 4-6C, and 4-7A | |
| 1 | NT2-24D | Remote Novatone multi tone audible. | 2.4W |
| 1 | 90P2X120AC24FC450W | Remote power supply 120V 50-60 Hz, 24 DC field contact voltage. 450W | |
| 2 | CF2 | Cooling fans 120V 50-60 Hz, mounted on rear cover. | |
| 1 | 90TP2 | Test probe | |
| Nameplate engraving as per customer supplied list.<br>*Extended component loads for power supply sizing. | | System Load (Watts) | 322.5W |

## Example #8 (Blind Set, Integral)



System Description—9 points single setpoint. Current input 4-20mA. Form C aux contacts. Window size 1 7/16" H x 3 5/16" W. Integral pushbuttons. Integral power supply 120VAC. Manual reset sequence AM.

| Qty. | Model No. | Component Description | *Load (Watts) |
|---|---|---|---|
| 1 | 94CA23 | Integral logic cabinet, 2 module rows high by 3 module columns wide. | |
| 5 | 92LA01 | Dual window light boxes. For two single setpoint indications. | 20W |
| 10 | 92NP1WH | White nameplates for dual point light boxes. | |
| 1 | 90F1X1PB | Flasher/audible output card (Pos. 1-3C). | 1.5W |
| 9 | 91AF3DB12DC4C | Single point sequence card, Sequence AF with integral Form C (SPDT) auxiliary contact (all module positions, slots A and C except 2-3 and slot C of 1-3) | 12.6W |
| 9 | 91AB1AXD1 | Analog input card (blindset) programmable for 0.25 to 1.25V to accept 4 to 20mA input signals (all module positions slots B and D except 2-3 and slot D of 1-3). | 20.7W |
| 9 | 90ATB9 | Current conversion resistor block 61.9 ohms, terminal mounts (all card positions B and D except 2-3 and D of 1-3). | |
| 1 | 90PB31P1PL | Pushbutton station position 2-3, ACK, RESET and TEST. | 2W |
| 1 | 90P1X120AC24FC80W1PB1PL | Integral power supply 120V 50-60 Hz input with one 90CWB3 FC jumper board. (Pos. 2-3) 80W | |
| 1 | NT2-24D | Novatone multi tone audible | 2.4W |
| 1 | 90TP2 | Test probe | |
| Nameplate engraving as per customer supplied list.<br>*Extended component loads for power supply sizing. | | System Load (Watts) | 58.3W |

# SERIES90 Power Consumption Charts

**INSTRUCTIONS FOR USE:**

DETERMINE TOTAL NUMBER OF SEQUENCE CARDS WITHIN SYSTEM (INCLUDING OPTIONS). QUANTITY TIMES APPLICABLE RATING(S) IS EQUAL TO THE NUMBER OF WATTS REQUIRED TO POWER SEQUENCE CARDS. REPEAT THIS PROCEDURE FOR LIGHTBOXES, ACCESSORIES AND ANALOG AS REQUIRED. WHEN TOTAL POWER (WATTS) IS CALCULATED REFER TO POWER SUPPLY PAGES 36 THROUGH 41 TO DETERMINE SIZE AND QUANTITY.

OR

**SEQUENCE CARD (PER CARD)**

| SINGLE POINT | WATTS 1GP | WATTS 2GP |
|---|---|---|
| 91AF* | 1.3W | 0.9W |
| 91AF10 | 1.3W | – |
| 91ARX | 1.3W | – |
| 91LNI | 1.3W | 0.9W |
| 91MCX | 1.3W | – |
| 91TF1 | 1.3W | 0.9W |
| 91TF2 | 1.3W | 0.9W |
| 91TF3 | 1.3W | – |
| 91TF4 | 1.3W | – |
| 91VAX | 1.3W | – |
| 91VRX | 1.3W | – |
| 91AS3 | 1.3W | – |
| 91MP1 | 1.3W | – |
| 91MP2 | – | 0.9W |

| TWIN POINT | WATTS 1GP | WATTS 2GP |
|---|---|---|
| 92AF* | 2.6W | 1.8W |
| 92AR* | 2.6W | – |
| 92LNI | 2.6W | 1.8W |
| 92MCI | 2.6W | – |
| 92TF1 | 2.6W | 1.8W |
| 92TF2 | 2.6W | 1.8W |
| 92TF3 | 2.6W | – |
| 92TF4 | 2.6W | – |
| 92AS3 | 2.6W | – |

(PLUS)

**INPUT OPTIONS (PER CARD)**

| SINGLE POINT | WATTS |
|---|---|
| T 24V | .072W |
| KN | .072W |
| NL | .072W |
| KP | .072W |
| TWM* | .20W |
| T 12V | .038W |
| KN | .038W |
| DM | 0 |
| DB | 0 |
| NL | .038W |
| KP | .038W |
| TWM* | .100W |
| T 48V | .144W |
| KN | .144W |
| NL | .144W |
| KP | .144W |
| TWM* | .390W |
| T 125V | .375W |
| KN | .375W |
| NL | .375W |
| KP | .375W |
| TWM* | 1.00W |

(PLUS)

**INPUT OPTIONS (PER CARD)**

| TWIN POINT | WATTS |
|---|---|
| NL 24V | .144W |
| KN | .144W |
| TA | .144W |
| TB | .144W |
| NL 12V | .076W |
| KN | .076W |
| TA | .076W |
| TB | .076W |
| DM | 0 |
| DB | 0 |
| NL 48V | .288W |
| KN | .288W |
| TA | .288W |
| TB | .288W |
| NL 125V | .750W |
| KN | .750W |
| TA | .750W |
| TB | .750W |

(PLUS)

**OUTPUT & MISC. OPTIONS (PER CARD)**

| SINGLE POINT | WATTS |
|---|---|
| 1PC & 1PR | 1.2W |
| 2PC & 2PR | .6W |
| 3PC & 3PR | 1.2W |
| 4PC & 4PR | .6W |
| 5PC & 5PR | .3W |
| 6PC & 6PR | .1W |
| 7PC & 7PR | .1W |
| 8PC & 8PR | .1W |
| 9PC & 9PR | .1W |
| *FTD | 0 |
| *ATD | 0 |
| *A,B & C | .5W |
| *KT | .4W |
| *KC | .4W |
| *KE | .4W |
| *EA,EB,EC,ED,EJ & EL | 0 |
| *CR | 0 |
| *RL | 0 |
| *LT | 0 |
| *FHC | 0 |
| *AA | 1.0W |
| ILCP (SHORT) | .27W |

24V ONLY

| TWIN POINT | WATTS |
|---|---|
| *FTD | 0 |
| *A & B | 1.0W |
| *KT | .8W |
| 4CR | 0 |
| *RL | 0 |
| *LT | 0 |
| *EE,EF,EG,EH & EK | 0 |

(PLUS)

**LIGHTBOXES (PER ASSEMBLY)** 2

| ANNUNCIATOR | WATTS |
|---|---|
| 91LA01 | 4W |
| 91LA02 | 4W |
| 91LA03 | 2W |
| 91LA09 | 0 |
| 92LA01 OR 03 | 4W |
| 92LA02 | 4W |
| 92LA04 | 8W |
| 93LA0* | 6W |
| 94LA0* | 8W |
| 96LA03 | 6W |
| 98LA03 | 8W |
| 94LA09 | 8W |

2

| LAMP CABINET | WATTS |
|---|---|
| 91LBX01 | 4W |
| 91LBX02 | 4W |
| 92LBX01 | 4W |
| 92LBX02 | 4W |
| 93LBX0* | 6W |
| 94LBX01 | 8W |
| 94LBX02 | 8W |
| 94LBX08 | 16W |
| 96LBX01 | 6W |
| 98LBX01 | 8W |

# SERIES90 Power Consumption Charts

| ACCESSORIES (PER ASSEMBLY) | |
|---|---|
| FLASHER | WATTS |
| 90F* | 1.5W |
| IDN OPTION | .5W |
| | |
| | |
| | |
| PUSHBUTTONS | WATTS |
| 90PB*111 | 2 |
| 90PB*112WH | 4 |
| 90PB*211 | 4 |
| 90PB*221 | 4 |
| 90PB*000 | 0 |
| IPL OPTION | 2 |
| 2PL OPTION | 4 |
| | |
| | |
| | |
| | |
| AUX. RELAY (REMOTE) | WATTS |
| 90AX* | 1.5W |
| | |
| AUX. RELAY CARD | WATTS |
| 90AXC* | 1.0W |
| | |
| AUDIBLE (HORN) | WATTS |
| NT2-24D | 1.5W |
| | |
| | |
| | |
| | |

(PLUS)

| REFLASH OUTPUT | | WATTS |
|---|---|---|
| 90RFR* | | 0.8W |
| | | |
| REFLASH INPUT | | WATTS |
| 90RF1 | | 1.4W |
| 90RF2 | | 2.2W |
| 90RF3 | | 2.5W |
| 90RF4 | | 1.4W |
| 90RF5 | | 2.0W |
| 90RF6 | | 2.2W |
| REFLASH SIGNAL INPUT | | WATTS |
| 90RF1 | 24V | .288W |
| 90RF2 | | .288W |
| 90RF3 | | .288W |
| 90RF4 | | .216W |
| 90RF5 | | .144W |
| 90RF6 | | .144W |
| 90RF1 | 12V | .152W |
| 90RF2 | | .152W |
| 90RF3 | | .152W |
| 90RF4 | | .114W |
| 90RF5 | | .076W |
| 90RF6 | | .076W |
| 90RF1 | 48V | .576W |
| 90RF2 | | .576W |
| 90RF3 | | .576W |
| 90RF4 | | .432W |
| 90RF5 | | .288W |
| 90RF6 | | .288W |
| 90RF1 | 125V | 1.5W |
| 90RF2 | | 1.5W |
| 90RF3 | | 1.5W |
| 90RF4 | | 1.125W |
| 90RF5 | | .750W |
| 90RF6 | | .750W |

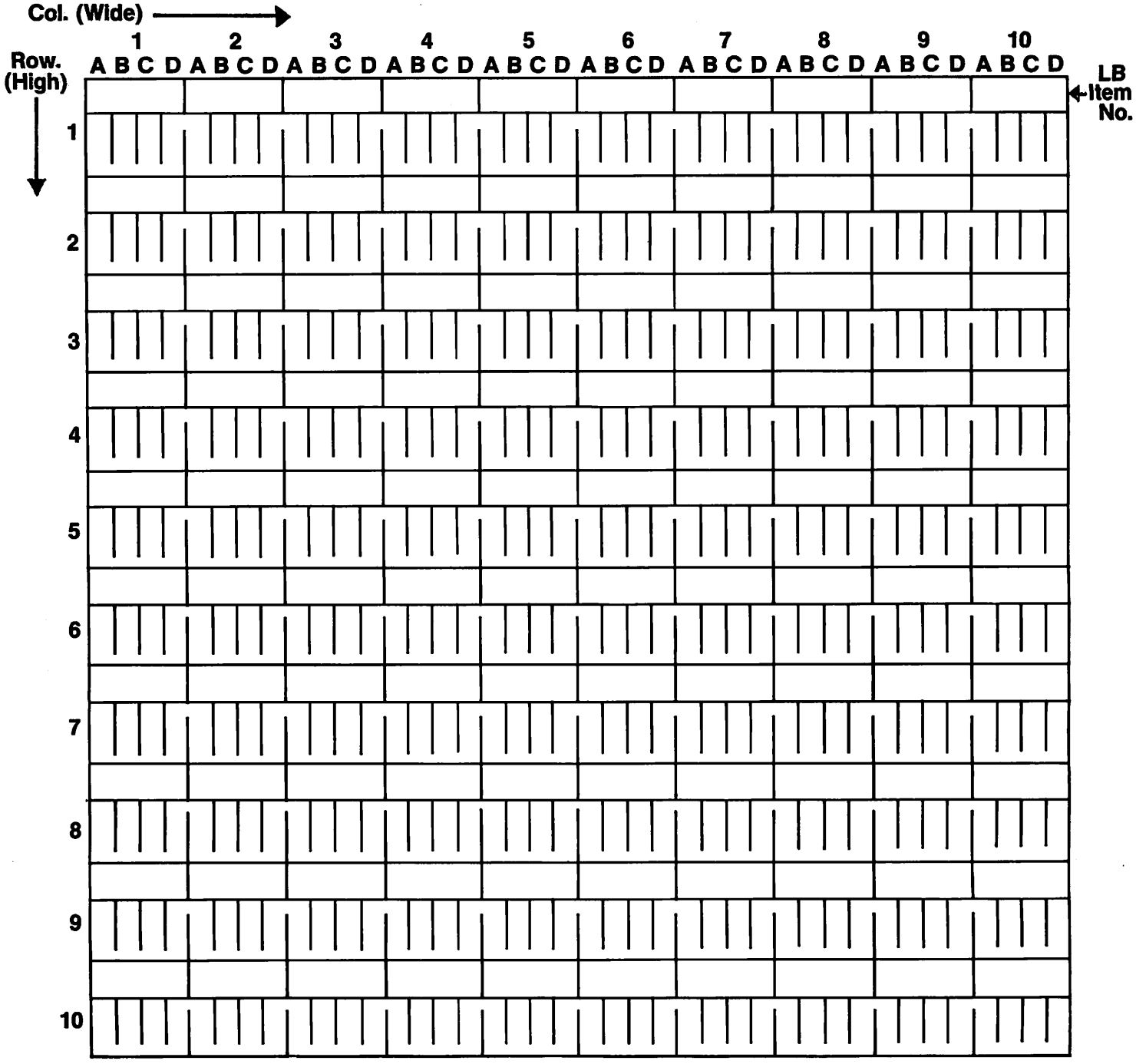
| ANALOG (PER ASSEMBLY) | |
|---|---|
| BLIND SET | WATTS |
| 91AB* | 2.3W |
| LC, PXD OPTION | 1.0W |
| | |
| | |
| | |
| | |
| METER SET | WATTS |
| 91AO* | 2.5W |
| LC, PXD3 OPTION | .75W |
| | |
| | |
| ANALOG OUTPUT | WATTS |
| 90AL* | 3W |
| | |
| DIGITAL DISPLAY | WATTS |
| 90F01 | 9.5W |
| MADE UP OF THE FOLLOWING | |
| (REF. 90CPX1) | 6.5W |
| (REF. 90YMX*) | 2.5W |
| (REF. 90FD1) | 0.5W |
| | |
| | |
| | |
| | |

= TOTAL SYSTEM POWER (SEE INSTRUCTIONS)

NOTE

1. TOTAL REFLASH CARD WATT RATINGS ARE CALCULATED BY ADDING THE REFLASH INPUT AND REFLASH SIGNAL INPUT WATT RATINGS EXAMPLE: 90RF1, 24V, 1.4W & .288W OR A TOTAL OF 1.688 WATTS.
2. FOR 6 OR 12 VOLT LAMP RATING REFER TO APPLICABLE 9*405-* WIRING DRAWING.
3. 6GP=0.9W

# SERIES90 Ordering Matrix




**FRONT VIEW (Size H x W) (Model No. )**

## Card/Lightbox Model Nos.

| Item No. | Item No. | Item No. |
|---|---|---|
| 1 | 8 | 15 |
| 2 | 9 | 16 |
| 3 | 10 | 17 |
| 4 | 11 | 18 |
| 5 | 12 | 19 |
| 6 | 13 | 20 |
| 7 | 14 | 21 |

## Guide for Use

1. Define cabinet size by heavying up cabinet (rows high x columns wide.
2. List model numbers in spaces at left.
3. Place card Item No. in each card position where card is to be slotted (position A, B, C, or D of each module). Repeat for each card used. Do same for lightboxes.
4. "–" indicates no card at this location.

# SERIES90 Tri-Point Annunciator

At a modest price, PANALARM can provide a composite customer wiring diagram, customized to the exact configuration of the Series 90 cabinet. The drawing incorporates all components of the annunciator system including remote devices such as auxiliary relays, horns and pushbuttons. CAD generated, the wiring diagram is extremely beneficial for customer start-up, virtually eliminating field problems related to wiring confusion.

This enhancement can also serve as a short-cut to helping customers with tying in the annunciator to their overall system drawing requirements.

For more information, contact the factory or your nearest PANALARM representative.

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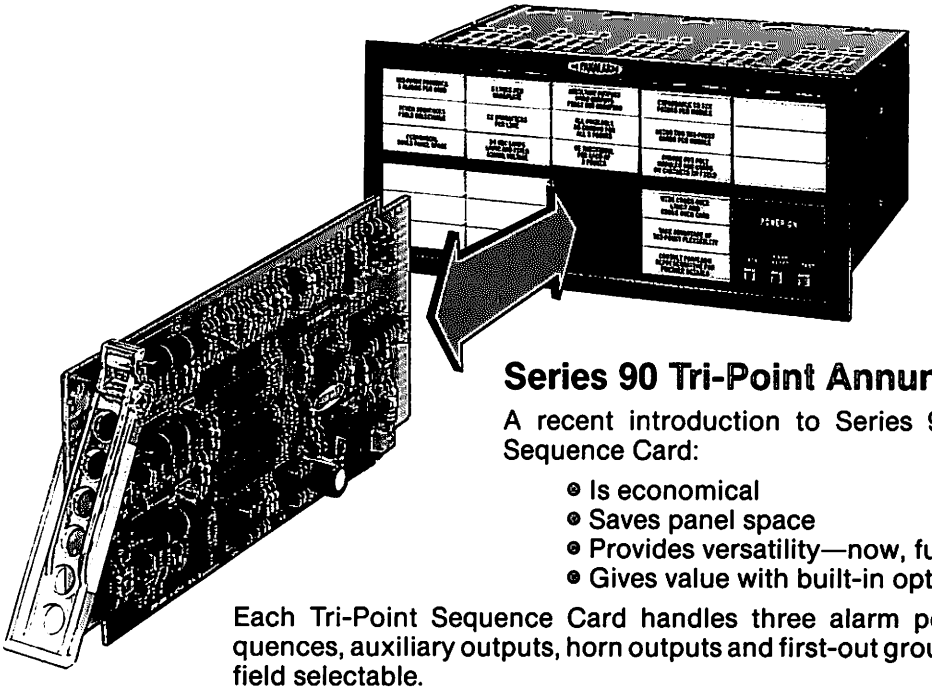

## Series 90 Tri-Point Annunciator

A recent introduction to Series 90, the Tri-Point Sequence Card:

- Is economical
- Saves panel space
- Provides versatility—now, future, retrofit
- Gives value with built-in options.

Each Tri-Point Sequence Card handles three alarm points. Seven sequences, auxiliary outputs, horn outputs and first-out grouping options are field selectable.

For additional information, refer to Bulletin 93 or consult your nearest PANALARM representative.

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## WARRANTY

Three year warranty in accordance with terms and conditions of sale, Form AP-85

## TERMS

Net 30 days, F.O.B. factory, freight prepaid and added. Shipments are normally made by UPS Ground or Motor Freight. For faster shipment, specify UPS Red or Air Freight.

## CONFIRMATION

Avoid duplication of Purchase Order by marking confirming Purchase Order "CONFIRMATION."

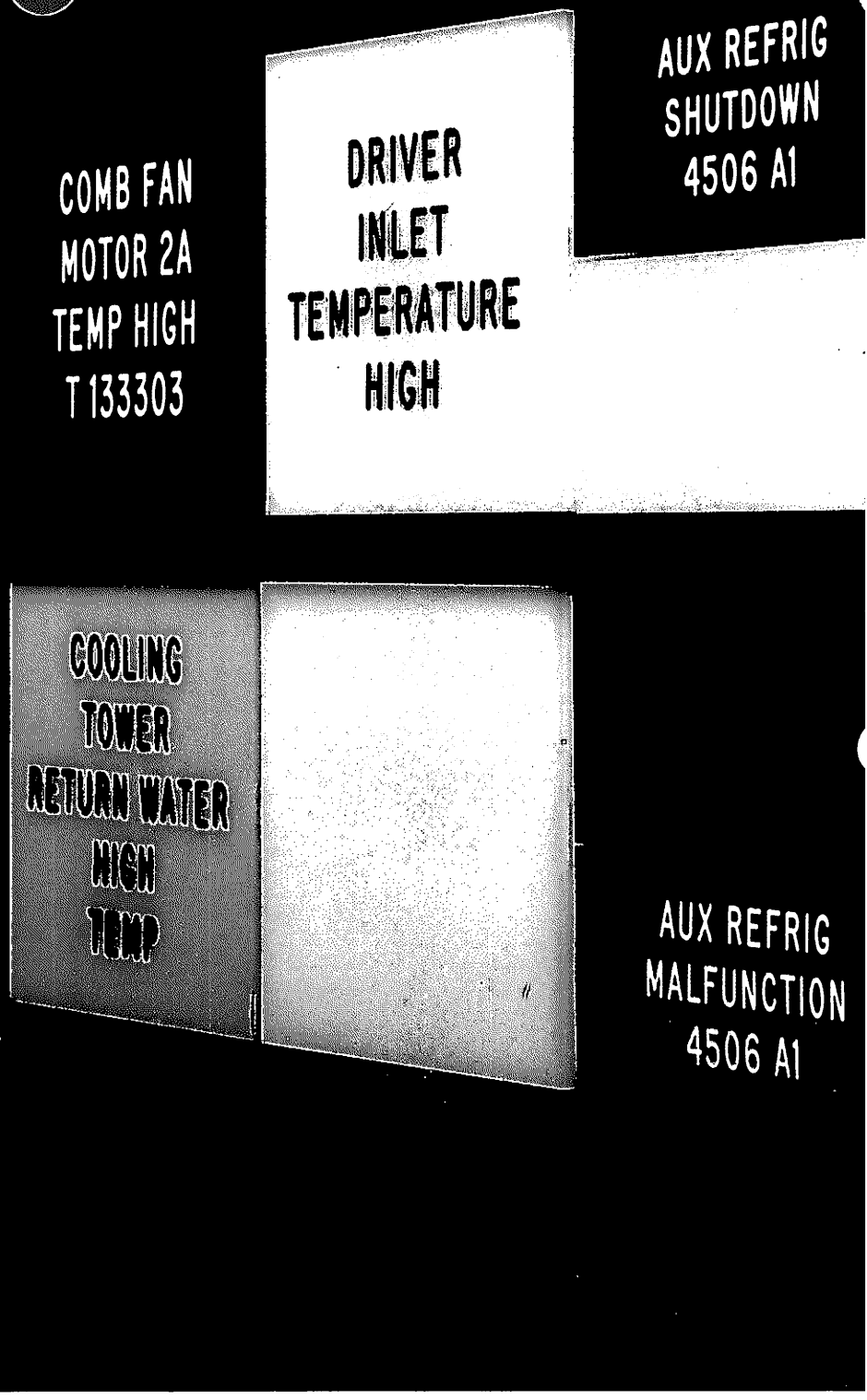
## SHIPMENT

Normal shipment is approximately four (4) weeks. However, please check with your nearest PANALARM representatives office. System requirements may be a determining factor.

*Specifications and designs subject to change without notice.*

# SERIES 90

## Annunciators And Analog Monitoring Systems

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