# SECTION VIII

# ENGINEERING CONSIDERATIONS

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## 1. GENERAL

**1.01** This section of the B325 technical manual describes the application of the B325 terminal (channel bank) in terms of system arrangements to provide interface to cable and radio transmission mediums. Interface with various types of office switching is also discussed. Carrier group alarm features are described. Typical rack profiles for multiple terminal installations are shown.

## 2. SYSTEM (END-TO-END) INTERFACE

### T-1 SPAN LINE INTERFACE

**2.01** See Fig. 1. The B325 terminal interfaces with any T-1 repeatered span line. The bipolar output of the B325 is a standard DSX-1 format signal. The B325 operates, end-to-end, with any D2/D3 channel bank.

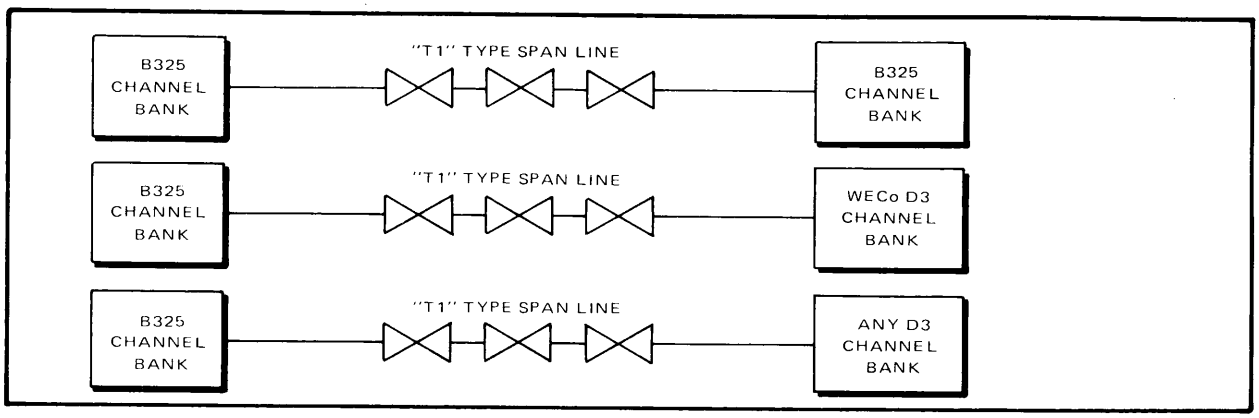


**Fig. 1—Basic T-1 Span Line Interfaces**

**2.02** Fig. 2 shows two B325 terminals operating end-to-end, via a span line that is equipped with Lynch B303 T-1 span line equipment and is protected with a Lynch B302 electronic span line switch (ESLS). A Lynch 303MA01 span terminating shelf provides office termination for the repeatered T-1 outside line.

**2.03** The T-1 outside line consists of Lynch 303RU Series low-simplex current/voltage repeaters, 303RH Series repeater housings, and 303FF Series active or passive fault-locate filters. Depending on several factors, an outside line ***span powering section*** may contain as many as 30 repeaters, in series. ***Span lines***, containing a number of ***span powering sections***, can be as long as 200 miles. For further details, consult the Lynch ***B303 Engineering Considerations and Design Procedures*** and the Lynch ***303RH Series Repeater Housing Description and Installation Manual.***

**2.04** The span line is terminated in the office at the span terminating shelf (303MA01). Office repeaters in several configurations provide send/receive direction electronics, error detection, simplex current regulation and span power conversion. Consult the Lynch ***Span Terminating Equipment Technical Manual*** for details.

**2.05** The Lynch B302 electronic span line switch (ESLS) provides protection for one to twenty-four service lines with a single protection (spare) line. Bipolar violation rate and pulse density of the service lines are monitored, with transfer to the protection line being made when the violation rate exceeds a certain level or when the pulse density falls below a certain level. The B325 terminal is switched from a failing service line to a protection line, thus freeing the protection line for use by other sections of the service span lines. Automatic reset from the protection line to the restored service line is accomplished in approximately 50 microseconds.

**2.06** Many T-1 cable routes contain unmanned offices. Some method of remotely monitoring and controlling the B302 switch activity in these unmanned offices is desirable. The status reporting and control (SRC) system, which is an option to the B302 ESLS, provides these functions. For more information on the B302 ESLS and its SRC option, consult the Lynch ***B302 Electronic Span Line Switch (ESLS) Technical Manual.***

## T1C and T2 SPAN LINE INTERFACE

**2.07** See Fig. 3 and 4. Two B325 terminals and a single D4 converter unit expand the B325 output to 48 channels, for use over a T1C line. The B325 is compatible, end-to-end, with other type D4 channel banks. Four B325 terminals (96 channels) will operate end-to-end with any four D2/D3 channel banks via a four-port M1-2 type multiplexer and T2 span line.

## MICROWAVE RADIO INTERFACE

**2.08** See Fig. 5. Four B325 terminals (96 channels) will operate end-to-end with any four

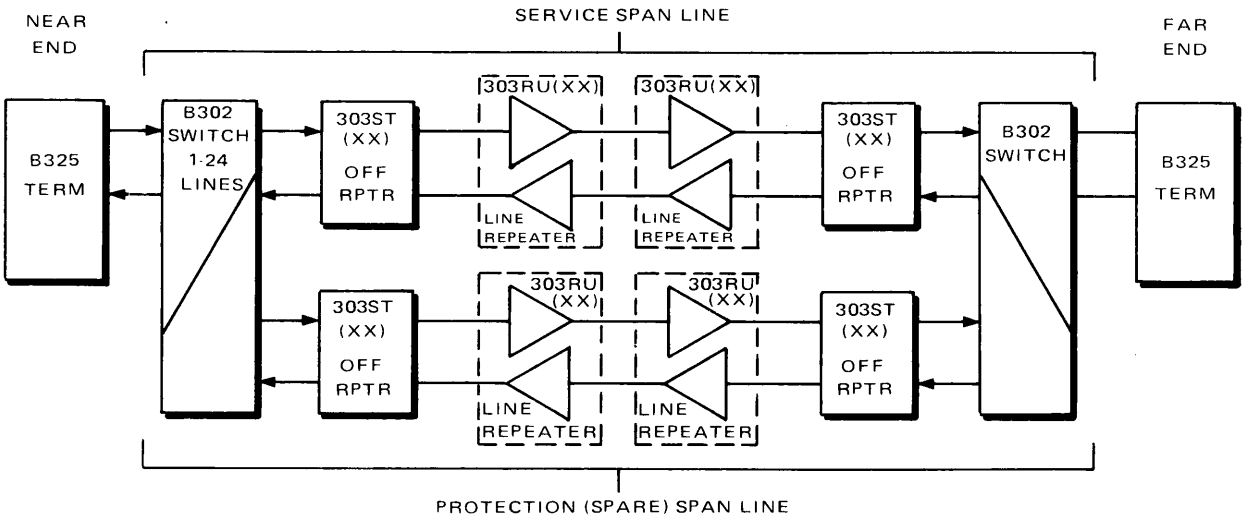


**Fig. 2—B325 Interface with Lynch B303 T-1 Span Line and B302 ESLS Switch**

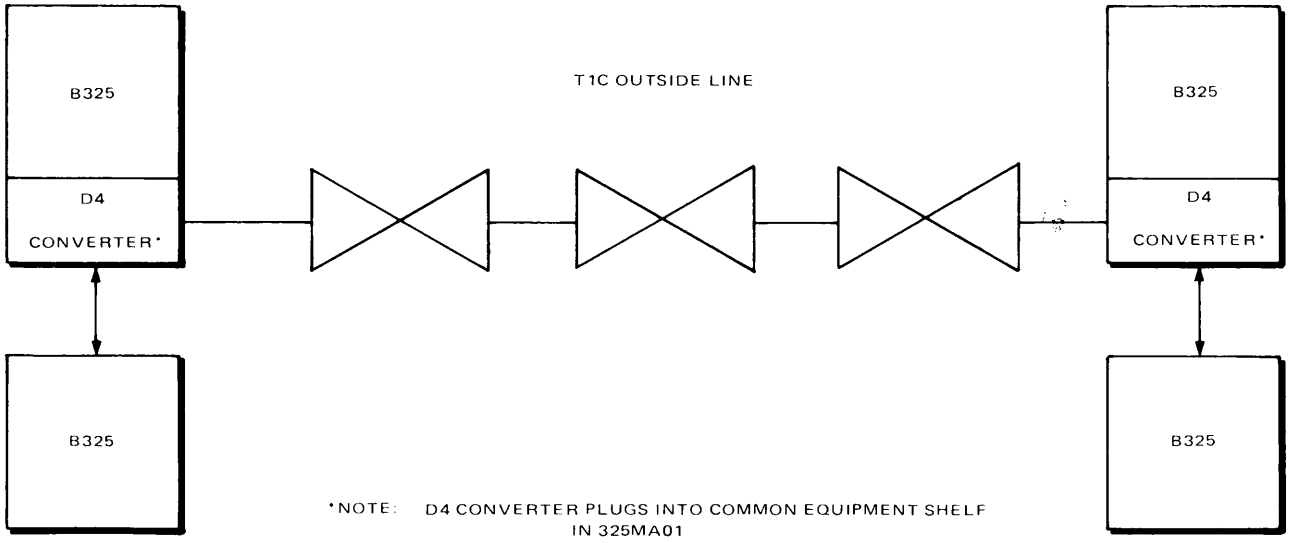


**Fig. 3—T1C Applications**

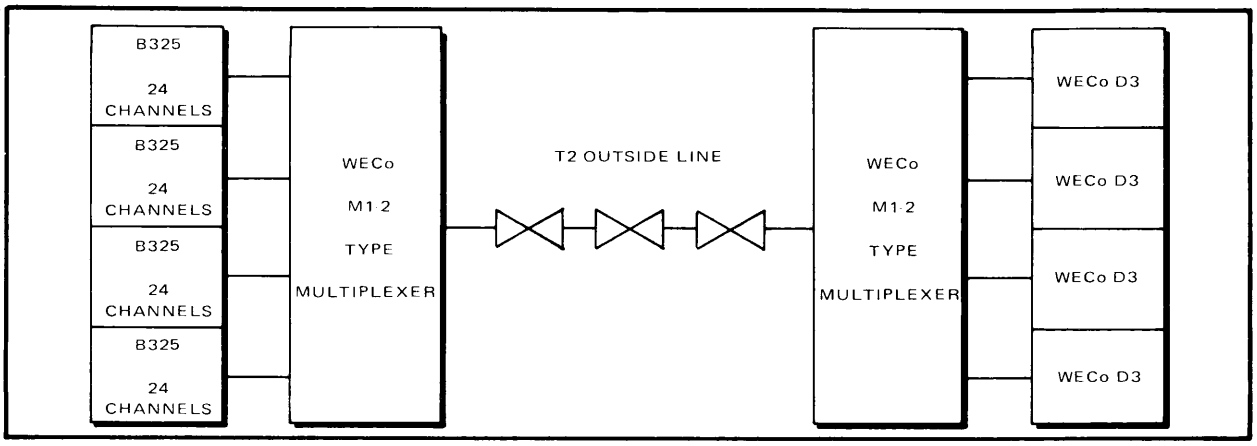


**Fig. 4—T2 Applications**

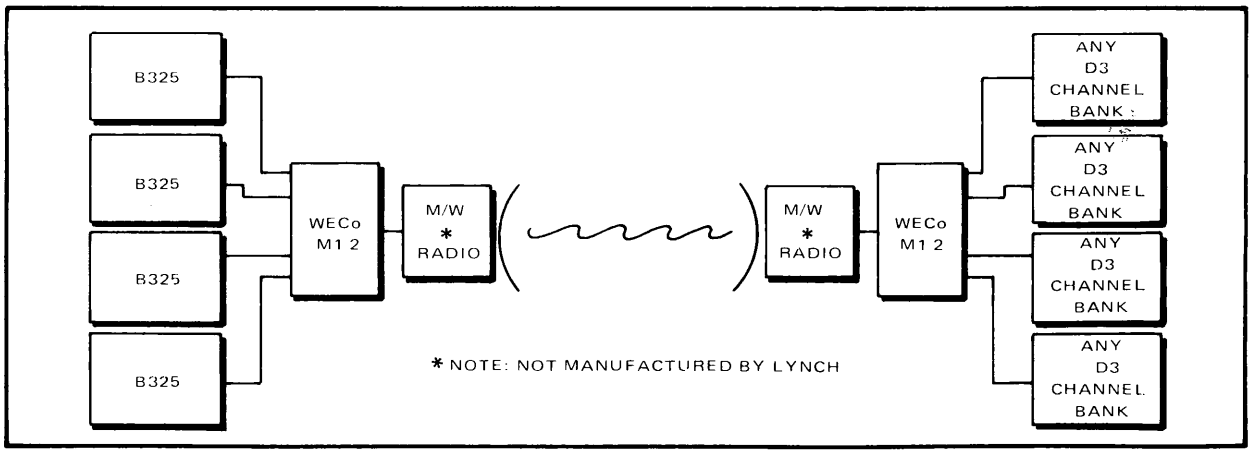


**Fig. 5—Microwave Radio Applications**

D2/D3 channel banks, via a four-port M1-2 multiplexer and intervening microwave radio link. Up to 12 B325s can be operated over a microwave radio, via a suitable 12-port multiplexer.

## 3. OFFICE INTERFACE

**3.01** See Fig. 6. The B325 channel units operate with most office switching schemes (e.g., Strowger, Stromberg-Carlson, XY, Step-byStep, Number 1 and 5 Crossbar and ITT Penta Conta). The B325 terminal can contain any mixture of the channel units listed in Table A, without additional engineering.

### DIAL-PULSE AND FOREIGN-EXCHANGE LOOP LIMITS

**3.02** A unique current-limiting circuit is employed in the dial-pulse originating channel unit (325DP01). This circuit provides ring-ground short protection by limiting maximum loop current into a zero-ohm loop. Maximum loop current is limited as follows:

Zero-ohm loop @ -44 Vdc 37 ma

Zero-ohm loop @ -50 Vdc 42 ma

Zero-ohm loop @ -56 Vdc 47 ma

Maximum loop current into 1500-ohm loop = 22 ma @ -44 Vdc

Maximum loop current into 1900-ohm loop = 21 ma @ -50 Vdc

A similar current-limiting circuit in the foreign-exchange ***subscriber end*** channel unit (325FX01) provides ring-ground short protection and the same loop limits.

**3.03** The resistance offered by the dial-pulse ***terminating*** channel unit (325DP02) and the foreign-exchange ***office end*** units (325FX02) is 950 ohms. However, the loop limits depend not only on the office battery voltage and minimum required loop current, but also on the characteristics of the A-relay in the incoming selector. The maximum overhang recommended is 500 ohms @ -50 volts office battery supply voltage.

### TRANSMIT AND RECEIVE LEVELS

**3.04** The standard XMT/RCV levels that apply to the input/output ports of the B325 channel units are as follows:

| | |
|---|---|
| 4-Wire Channel Units: | XMT -16 dBm |
| | RCV +7 dBm |
| 2-Wire Channel Units: | XMT 0 dBm |
| | RCV -2 dBm |

Both the two-wire and four-wire channel units are adjustable. The digital milliwatt provided in the 325AP01 unit as a standard feature allows precise level alignment of a B325 terminal, on a looped basis.

### CARRIER GROUP ALARM (CGA) FEATURES

**3.05** The B325 channel units have carrier group alarm (CGA) trunk conditioning. The purpose of this type of conditioning is twofold: it stops charges to customers and makes-busy all trunks in that particular trunk group. Table A summarizes the effect of CGA trunk conditioning on various channel unit configurations.

### MAKE-BUSY SWITCH

**3.06** All channel units contain MAKE-BUSY switches and LED MAKE-BUSY indicators. When the switch is operated, it busies the near-end channel unit. In addition, when the MAKE-BUSY switch on the 325DP02 unit is operated, it busies both the near end and the far end. The MAKE-BUSY switches also open the tip and ring lines on some models.

### EMPTY SLOT CONDITIONING (CHANNEL UNIT REMOVAL)

**3.07** Connector empty, parallel contact shorting is employed at two contact locations on all channel unit connectors to provide automatic lead conditioning at channel unit removal. (See Fig. 7.)

**3.08** Channel unit removal produces a ground at connector pin V (via pin J to pin 8 contact closure) to provide S-lead control at dial pulse originating channel unit locations or OS/MB-lead control at E&M channel unit locations.

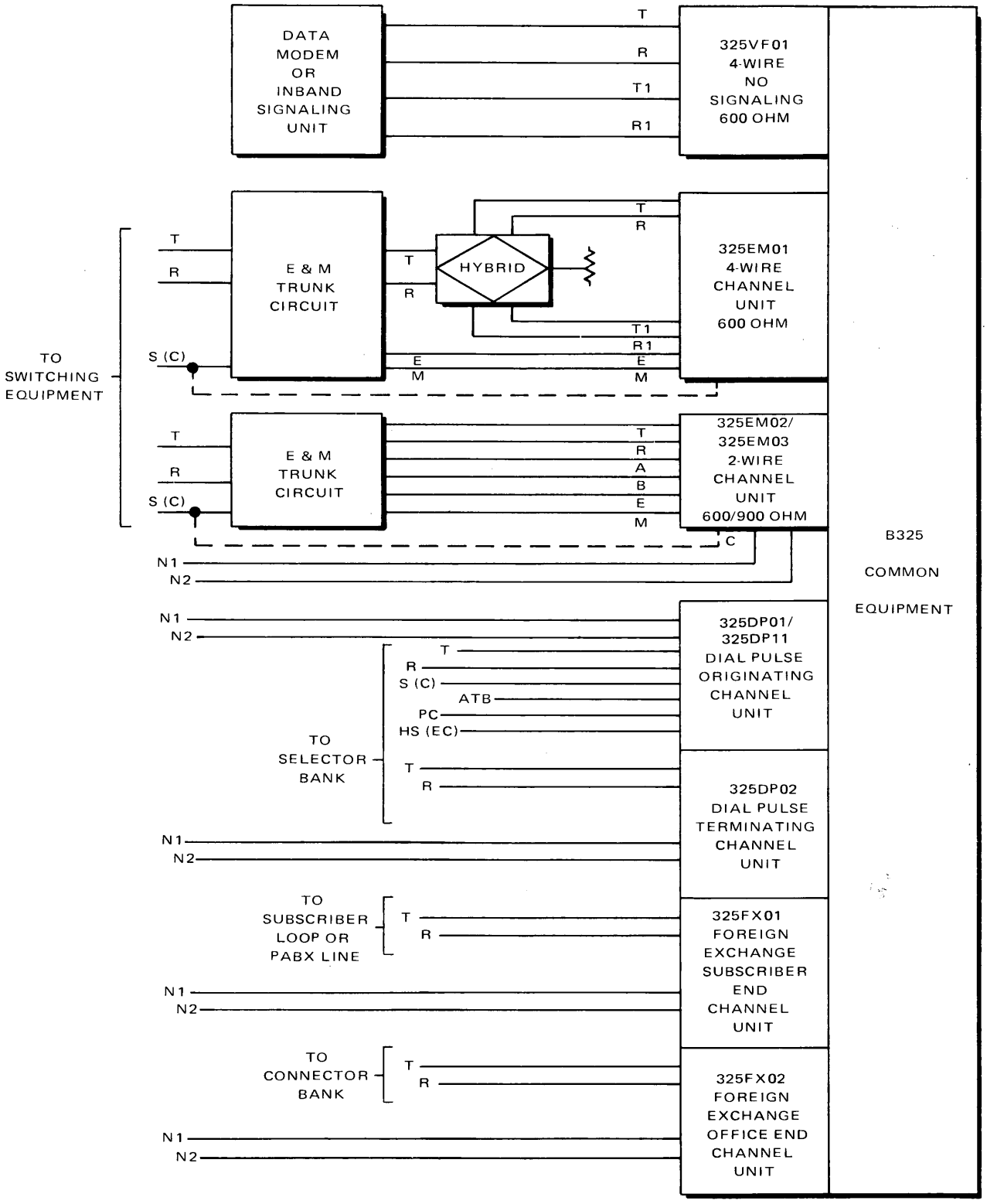


**Fig. 6—Channel Unit Applications**

## TABLE A

## CHANNEL UNIT CGA CONDITIONING

| CHANNEL UNIT TYPE | CONDITIONING |
|---|---|
| E&M (325EM01, 325EM02 and 325EM03) | 1. OS/MB-lead is grounded upon alarm detection. Ground remains applied through duration of alarm.<br>2. E-lead control is strap optioned for one of two sequences, according to trunk type.<br>a. E-lead is forced open upon alarm detection and remains open during entire alarm sequence.<br>b. E-lead is forced open upon alarm detection then busy (strappable ground or battery) after first alarm sequence*. Busy signal remains applied through duration of alarm. |
| Dial Pulse Originating (325DP01) | 1. S-lead is grounded and ATB-lead is forced open upon alarm detection. After first alarm sequence*, a 45 millisecond "wink" signal momentarily opens S-lead and grounds ATB-lead. Grounded S-lead and open ATB-lead conditions are then maintained through duration of alarm.<br>2. Tip and ring line reversal is inhibited through duration of alarm. |
| Dial Pulse Terminating (325DP02) | Loop closure is disabled upon alarm detection and remains disabled through duration of alarm. |
| Foreign Exchange Subscriber (325FX01) | 1. Tip ground removed upon alarm detection and remains removed through duration of alarm.<br>2. Ringing is inhibited upon alarm detection and remains inhibited through duration of alarm. |
| Foreign Exchange Office (325FX02) | 1. Loop closure is disabled upon alarm detection and remains disabled through duration of alarm.<br>2. Ring ground is disabled upon alarm detection and remains disabled through duration of alarm. |
| Voice Frequency (325VF01) | OS/MB-lead is grounded upon alarm detection. Ground remains applied through duration of alarm. |

*Alarm and power unit (325AP01) may be strapped to provide 2-second or 12-second first alarm sequence (trunk processing).

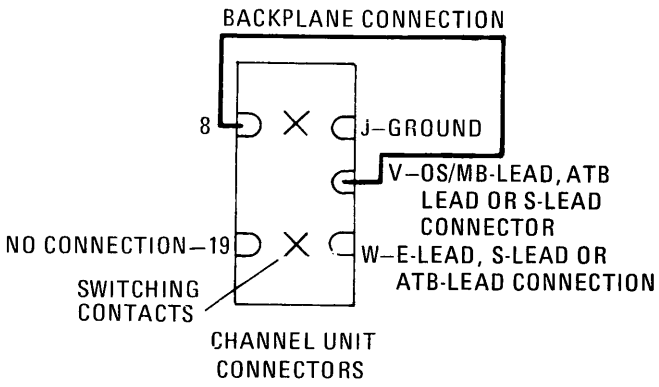


**Fig. 7—Lead Conditioning for Empty Channel Unit Slot**

**3.09** Channel unit removal produces an open circuit condition at connector pin W (E-lead for E&M channel units, ATB-lead for dial pulse originating channel units). However, installer may wire pin 19 to provide a ground or battery connection at pin W (via pin 19 to pin W contact closure) when the channel unit is removed.

## 4. RACK PROFILES

**4.01** Fig. 8 shows a typical rack profile (for 9-foot racks and for 11-foot 6-inch racks) that contains six and eight B325 terminals and the associated T-1 span equipment.

**4.02** A 302MA01 shelf provides electronic span-line protection to all T-1 service lines, via one protection (spare) line. A fault test panel (303-FT01) provides termination for (up to) four fault-locate lines, fault-locate line powering and order-wire access.

**4.03** A 303MA01 shelf and associated office repeaters provide send/receive electronics, simplex current regulation, power converter and error detection.

**4.04** A battery and alarm unit (300BA01) provides "quiet battery" and alarm relaying for all terminals in the profile rack.

**4.05** Fig. 9 shows high-density loadings of a 9-foot rack and an 11-foot 6-inch rack. Nine terminals (216 channels) can be mounted into a 9-foot rack. Twelve terminals (288 channels) can be mounted in an 11-foot 6-inch rack.

**4.06** As noted, the above rack profiles are typical. Many other combinations of terminals and ancillary equipment are possible. The combinations are limited only by available rack space and the environmental and installation considerations.

*Note:* Jack fields, span and fault-locate terminating equipment should be located at an access height that is convenient for operating and maintenance personnel.

## 5. JACK FIELDS

**5.01** See Fig. 10. The Lynch 300JF Series jack fields provide various two-wire, four-wire, and signaling access jack arrangements for one system (24 channels) or two systems (48 channels).

## 6. LYNCH CUSTOMER ENGINEERING

**6.01** Contact Lynch Customer Engineering Department for interface requirements, equipment configurations, special requirements, etc. Also, the departmental personnel will furnish quotes on equipment furnished and installed (EF&I).

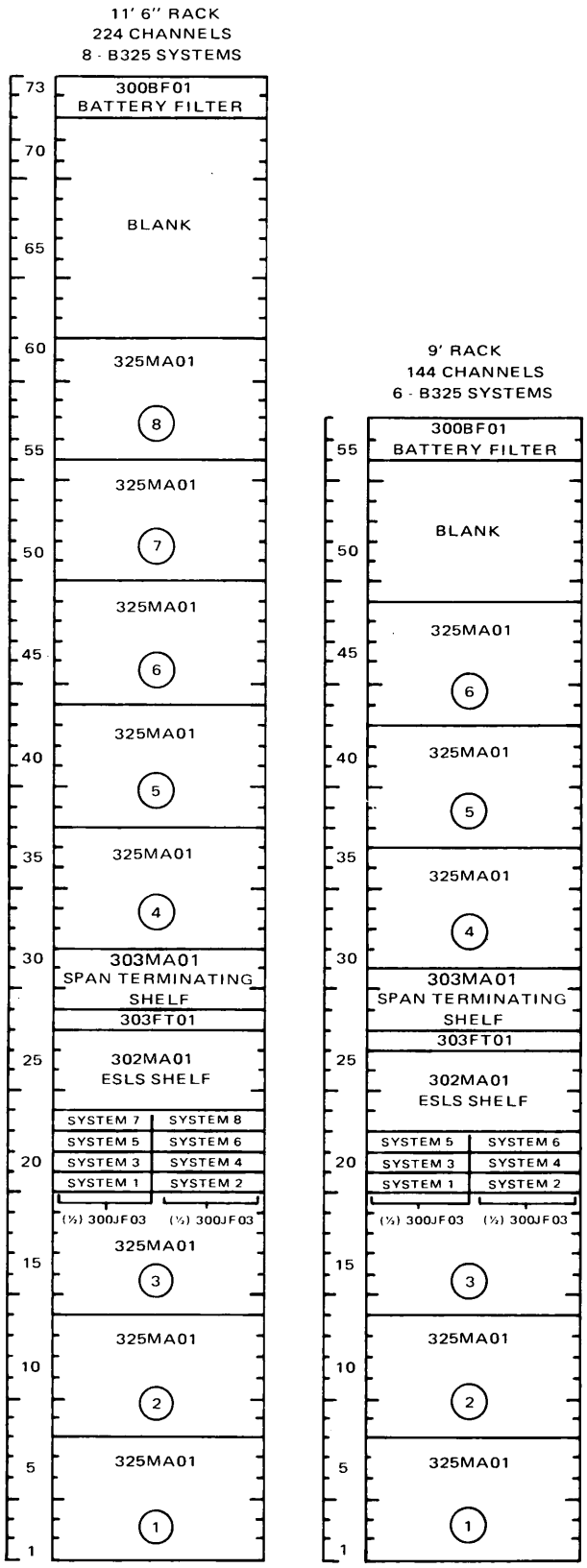


**Fig. 8—Rack Profiles (11' 6" and 9' Racks) with Ancillary Equipment**

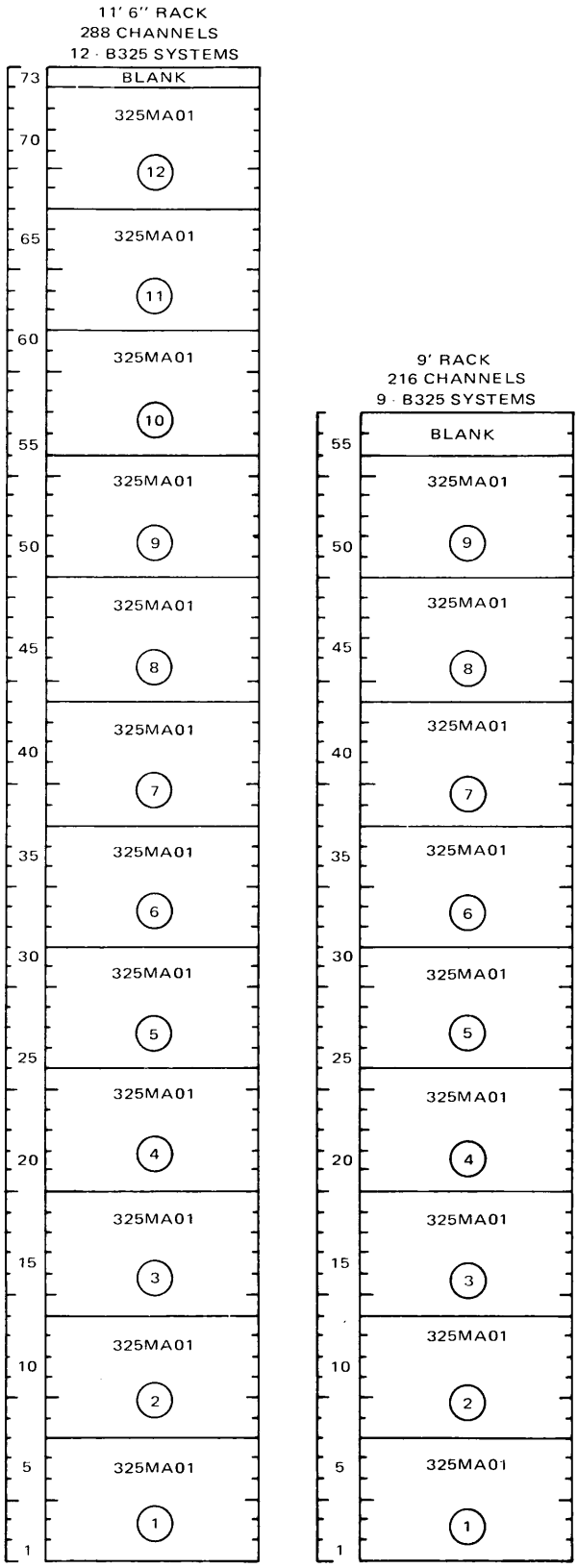


**Fig. 9—Rack Profiles (11' 6" and 9' Racks), High-Density Loading**

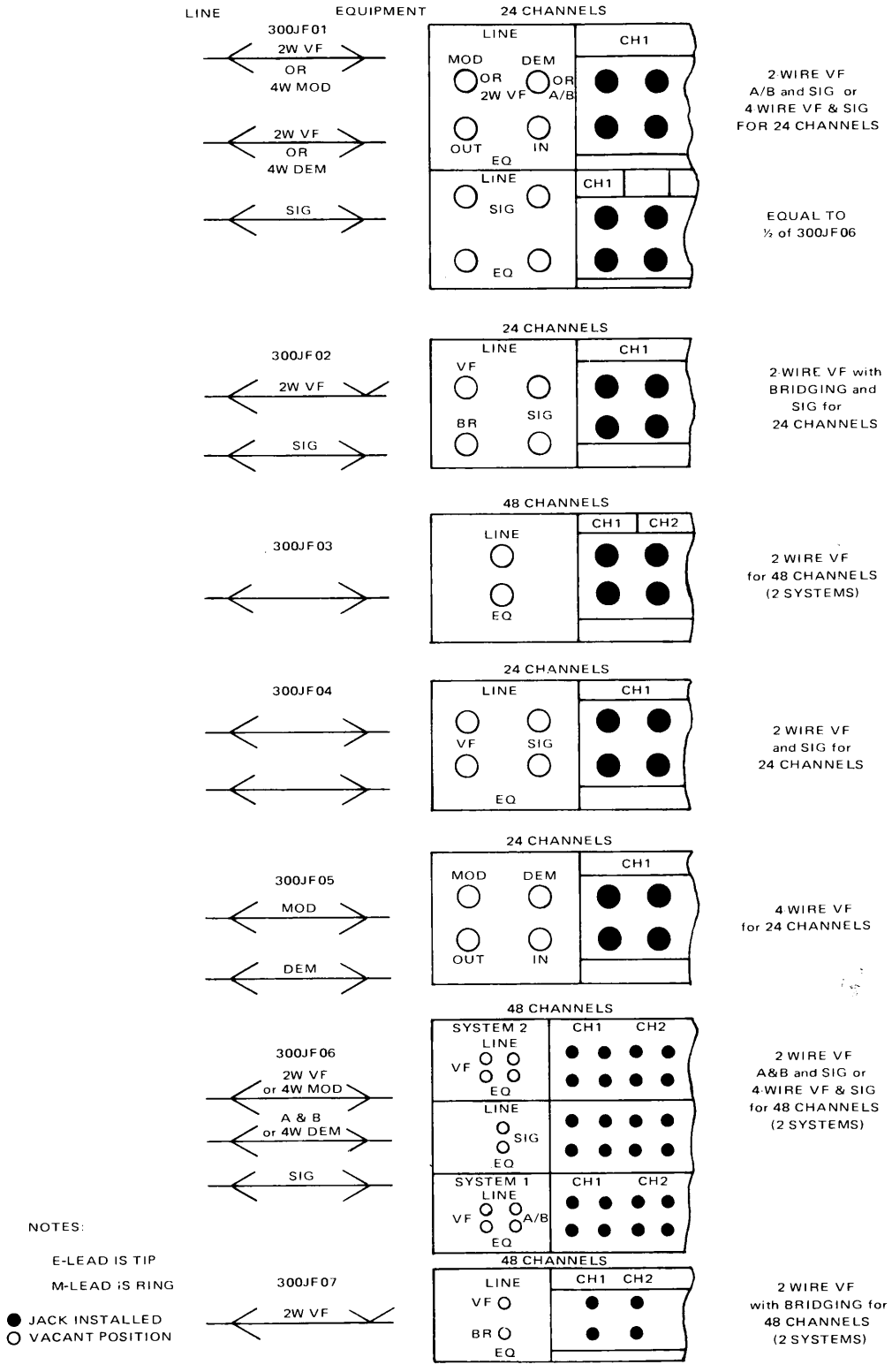


**Fig. 10—300JF Series Jack Fields**

ETHERNET

| | | |
|---|---|---|
| W | OR | — 1 |
| | OR | — 2 |
| W | GR | — 3 |
| | BL | — 4 |
| W | BL | — 5 |
| | GR | — 6 |
| W | BR | — 7 |
| | BR | — 8 |