FDO 3000 Order-Wire Off-Net (Packages*)

Fig. 1 - FDO 3000 Off-net with DVF-64 digital VF interface card provides telephone network interface for order-wire on 64 Kbit service channel.

Description

With DPS' FDO 3000 Order-Wire Off-Net your network can have world-wide voice communication ability. The FDO 3000 interfaces DPS' FDO 1000-series order-wires to the public switched telephone network (PSTN) via 2 wire line.

DTMF Selective Signaling

The DPS FDO Off-Net uses its on-board microprocessor to synthesize and decode DTMF signaling tones. The Off-Net can be programmed for automatic privacy, manual privacy, no privacy and hoot-n-holler modes.

Companion Order-Wire

The FDO 3000 Off-Net is normally installed adjacent to an FDO 1000 Order-Wire terminal. In VF network applications, the off-net interfaces the order-wire network either directly or through the 4-way passive bridge on the order-wire. If the off-net is used in a digital network, its voice signal is converted to digital by an Adaptive PCM (ADPCM) card in the order-wire housing.

Digital Interface

The FDO 3000 Off-Net can be equipped with a DVF-64 digital interface card in the expansion card slot. This interfaces a 24 Kbit port to the ADPCM card in the order-wire. The DVF-64 also provides an 8 Kbit packetized data port and a 32 Kbit analog telemetry port.

LED Indicators

Front panel LEDs indicate off-hook, incoming call ringing and channel busy. Front panel test points and level controls allow calibration while the unit is in place. LEDs on the optional DVF-64 card show channel status and repeater mode status.

Change Notice

1-29-99: Added DVF card LED information.

3-23-99: Converted to User Manual, general corrections, clarified term. / rptr. switch, added Table F.

5-11-99: Added center fold, model chart and glossary.

Addressing

The Off-Net responds to two or three digit addressing. A leading zero in the address will set it for two digits. Rotary switches on the P.C. Board allow the address to be easily set. The station address is posted on the front panel with stick-on labels (labels are included).

Network Control

In privacy modes, the FDO 3000 generates DTMF tones to control access to the order-wire network. When an off-net caller calls the off-net while the order-wire network is in the busy state, he will hear a busy signal. If he calls while the network is un-busy, he hears dial tone and an off-hook tone is generated to the order-wire network. This causes other stations on the network to assume a busy state. If any order-wire station phone is picked up during the busy state, a busy signal will sound in the earpiece. Stations that are busied remain in that state until their station code is dialed from the caller's phone or until the caller hangs up, generating an on-hook tone.

Order-wire stations call the off-net by dialing a one, two or three digit code, like any other station. The off-net seizes the PSTN line and returns dial tone from the central office or PBX. The caller then dials an off-net number

Table of Contents

*See Table F on page 12 for a listing of packages that use the FDO 3000 Off-Net.

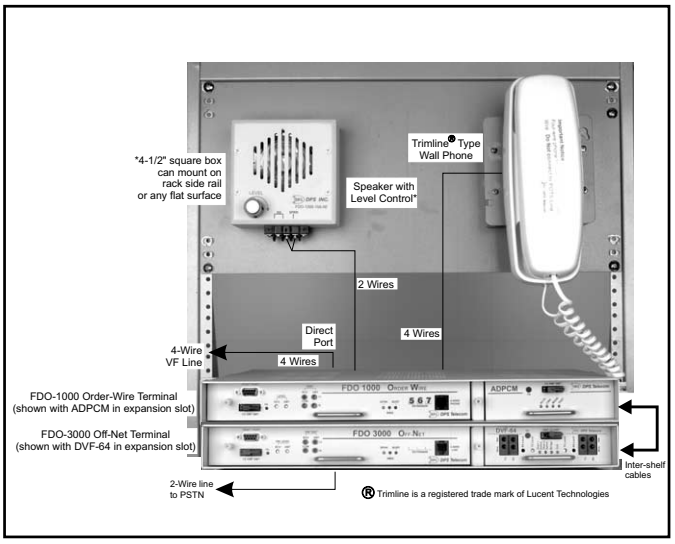


Fig. 2 - Use an External Speaker and Wall Phone for a basic order-wire terminal.

as though he were using a regular phone. Upon completion of the call, the off-net sends an on-hook tone to the order-wire to reset the busy state.

Application Packages

The FDO 3000 is available in an application package that includes the DVF-64 digital interface, the FDO 1000 Order-Wire and an ADPCM card. Details on this package are provided later in this document.

DVF-64 Digital-VF 64 Kbit Converter

DPS' Digital-VF 64 KBit Converter (DVF-64) is an ideal solution for those network operators with an embedded analog network who find themselves stepping up to a digital network such as SONET. The DVF-64 provides an interface between an analog voice frequency network or device and a 64 kilobit digital overhead on a network such as SONET.

Two separate VF circuits are included on the module, with a switchable bridging network that allows the two circuits to perform in a either a terminal or a repeater application. Signals at the VF ports are converted to a 32 Kbit channel.

The DVF-64 provides a 24 Kbit port for digital order-wire to interface via the ADPCM card.

It also provides a dual 8 Kbit port for RS 422 data.

The DVF-64 assembles the three digital channels into one 64 Kbit data stream.

The DVF-64 is available as an expansion card that fits into the expansion card slot on a DPS KDA network element.

DVF-64 Connectors

When the off-net chassis is equipped for a DVF-64 digital interface card in the expansion card slot, the back panel includes connectors for interfacing the ADPCM card in the companion order-wire shelf. Connectors are

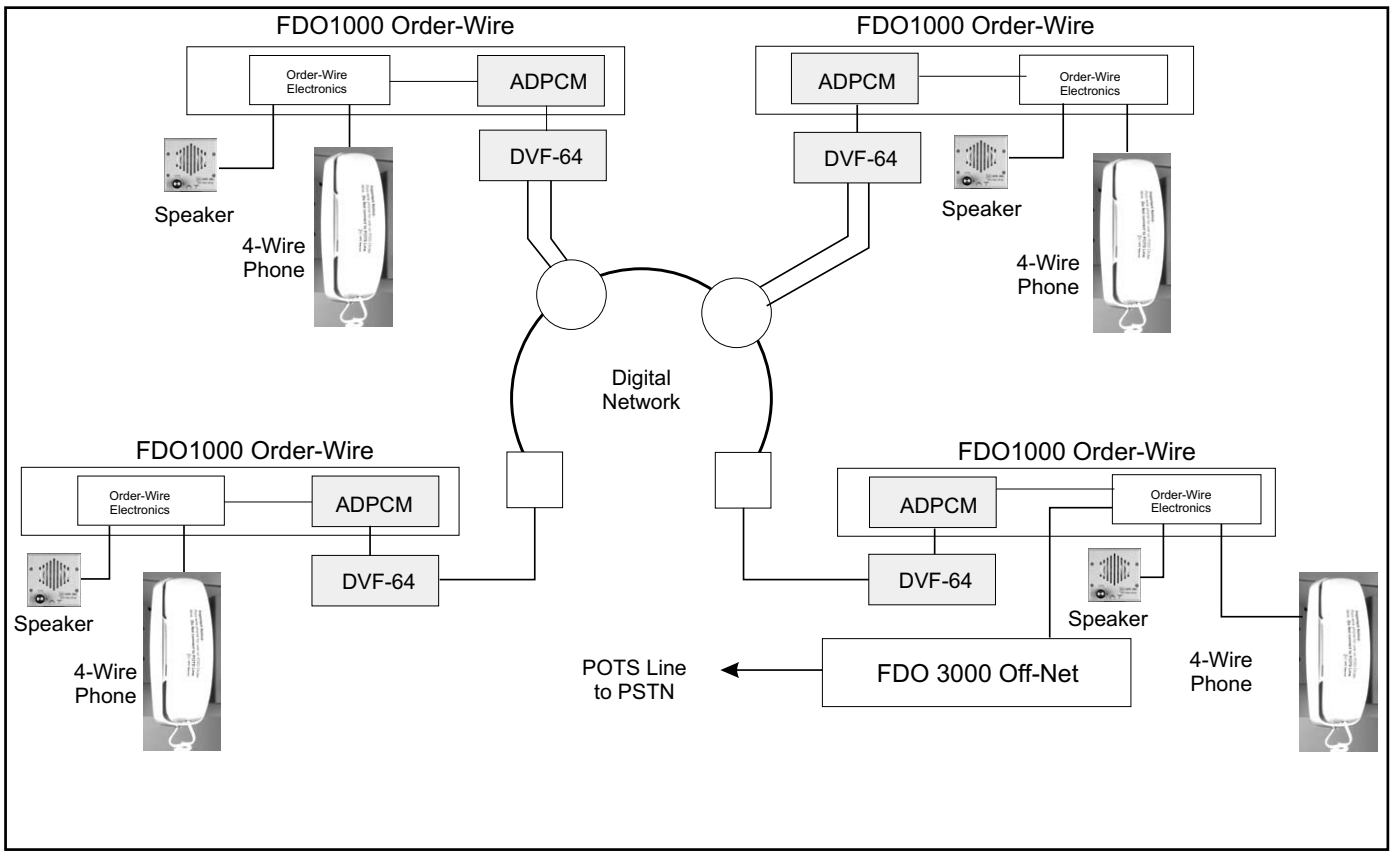


Fig. 3 - A digital order-wire network provides voice communications between telecom sites and to the Public Switched Telephone Network (PSTN) via a Plain-Old Telephone Service (POTS) line.

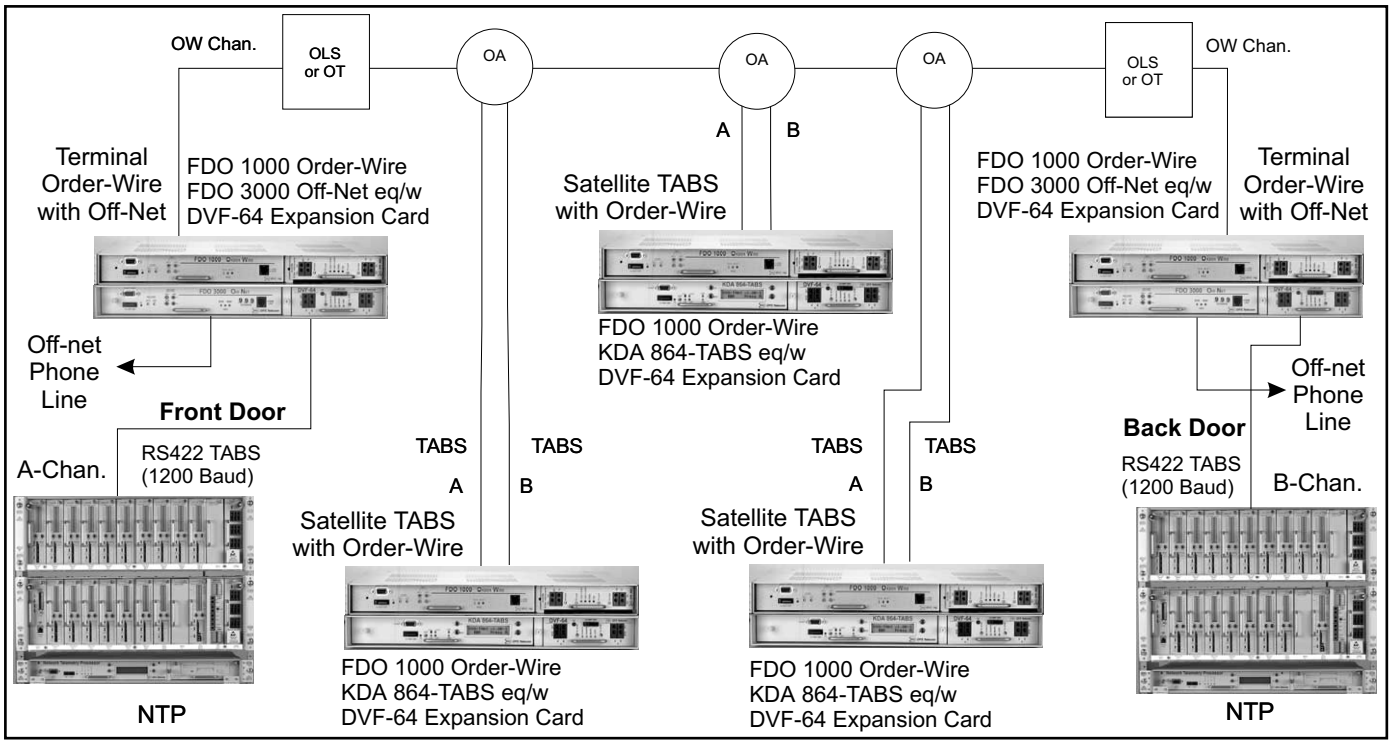


Fig. 4 - The ADPCM and DVF-64 modules digitize order-wire to put it on SONET.
NOTE: A more complete network diagram is shown in Fig. 9.

also provided for interfacing A and B sections on the 64 Kbit channel. Access to the other DVF-64 ports is provided at the wire-wrap block.

Applications

DTMF Selective Signaling

Fig. 2 shows the basic components of the order-wire off-net terminal. The off-net interfaces the order-wire network via the order-wire shelf. In VF networks the interface uses the order-wire's passive bridge. In digital applications the off-net uses the repeater port on the

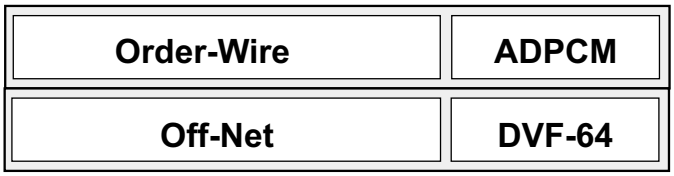


Fig. 5 - Node package fits in a two rack-unit housing.

ADPCM card, which is located in the order-wire shelf.

Station call codes are programmed manually with rotary switches on the off-net P.C. board. Number labels are provided to put on the front panel to indicate the setting.

Each site should be equipped with a 4-Wire DTMF phone and external speaker for the order-wire.

Applications with the DVF-64 and ADPCM

The FDO 1000 Order-Wire with ADPCM can be combined with an FDO 3000 Off-Net module to make a "Terminal Package" for interfacing voice and a PSTN connection to SONET. The DVF-64 card resides in the expansion card slot of the off-net chassis. (Figs. 4, 5 and 13) Fig. 4 also illustrates TABS alarm data being routed to an NTP at the off-net sites. The NTPs connect to the DVF-64 card's 8 Kbit TABS ports at the wire-wrap block on the back of the off-net shelf. (Figs. 7 and 14)

Shipping List

- FDO 3000 Off-Net card
- Shelf*
- Mounting Hardware*
- Fuses
- Operation Guide
- DVF-64 Card
- Interconnecting cables

* Not included with an "expansion package." See Table F and Fig. 8.

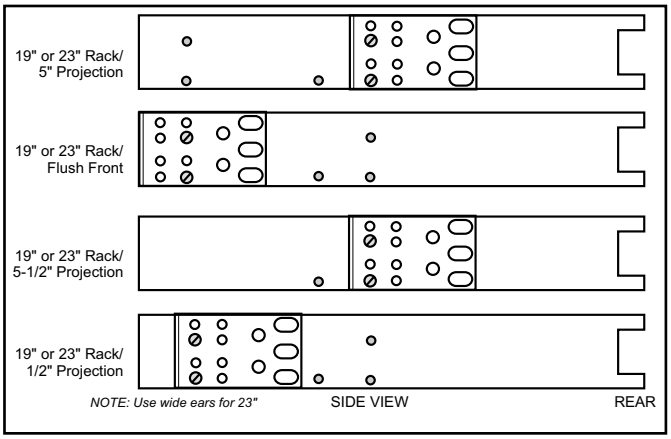
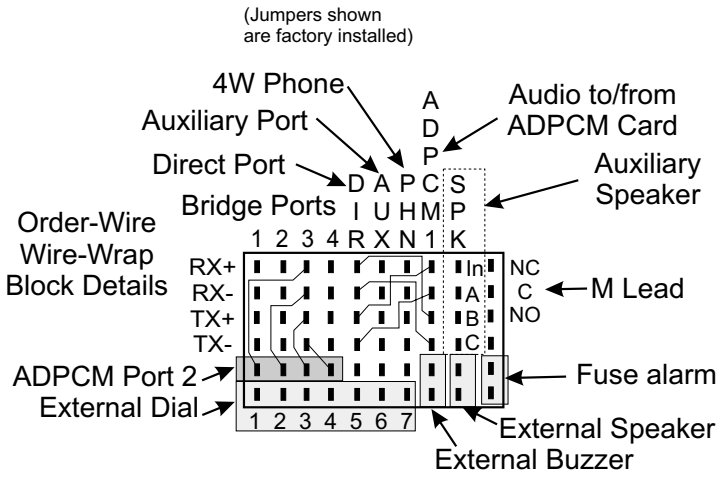
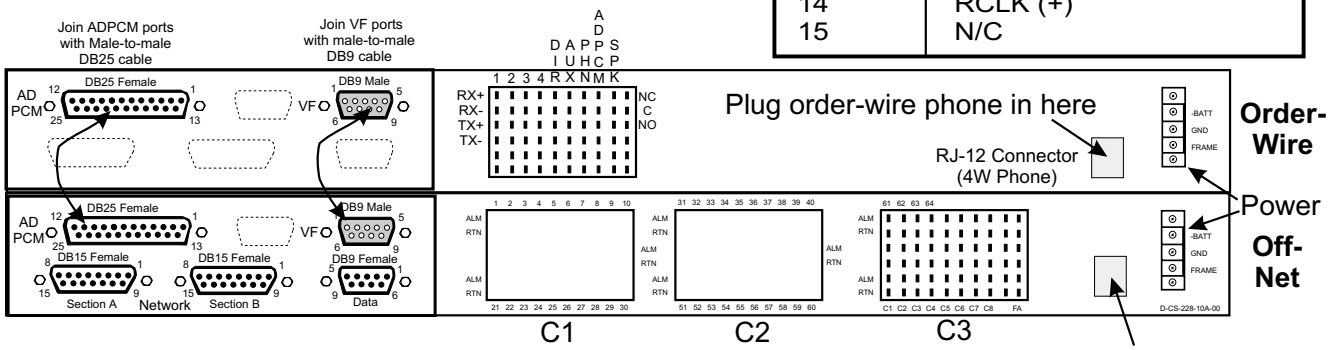


Fig. 6 - Position mounting ears for desired projection.

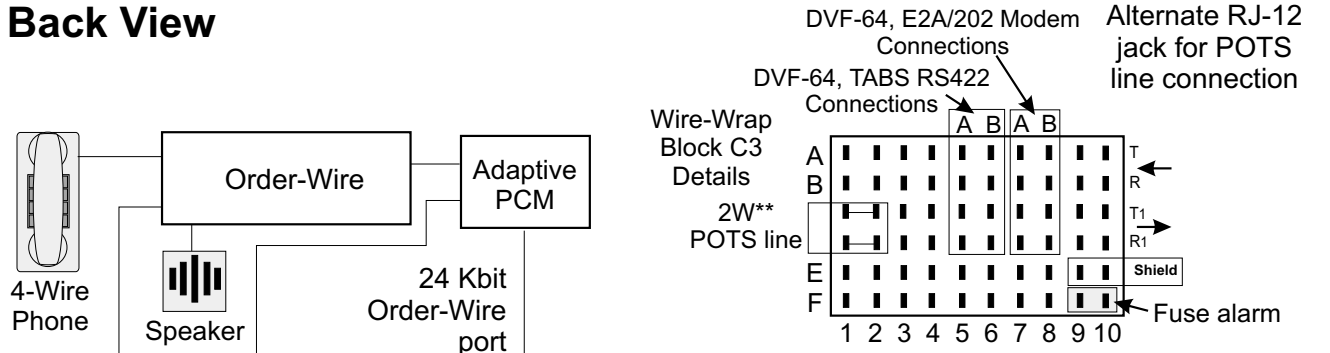
Table A - Network Connector Pinouts (DB 15 - DTE)

Pin No.	Function
1	TCLK (-) (Clock input)
2	TSYN (-) (Sync input)
3	TXD (-) (DPS data output)
4	RXD (-) (DPS data input)
5	RSYN (-)
6	RCLK (-)
7	N/C
8	N/C
9	TCLK (+)
10	TSYN (+)
11	TXD (+) (DPS data output)
12	RXD (+) (DPS data input)
13	RSYN (+)
14	RCLK (+)
15	N/C

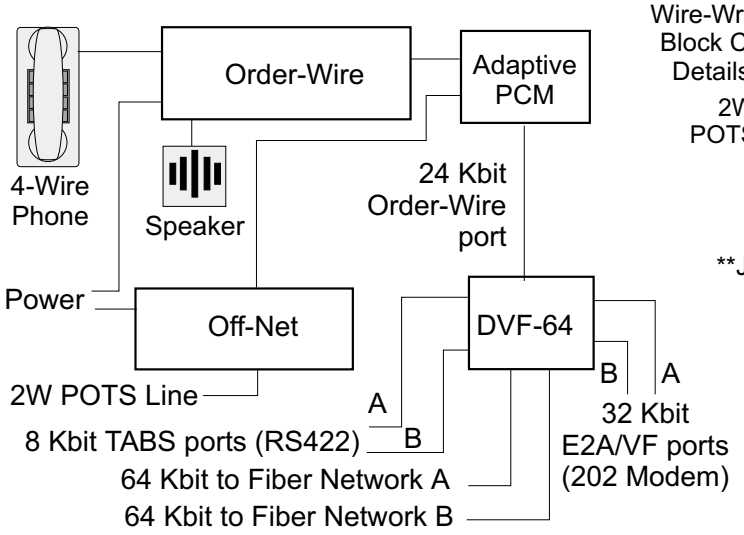


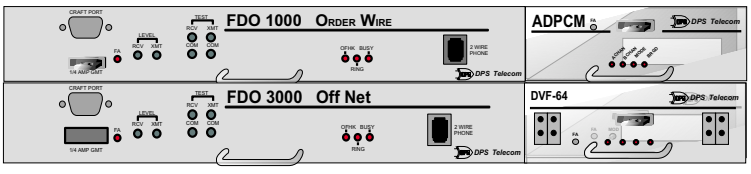


Back View



**Jumpers are factory installed for Off-Net application.





Front View

Terminal Order-Wire w/ Off-Net Package
D-PG-410-11C-00
4-7-99

Fig. 7 - 410 package combines order-wire and off-net in digital applications.

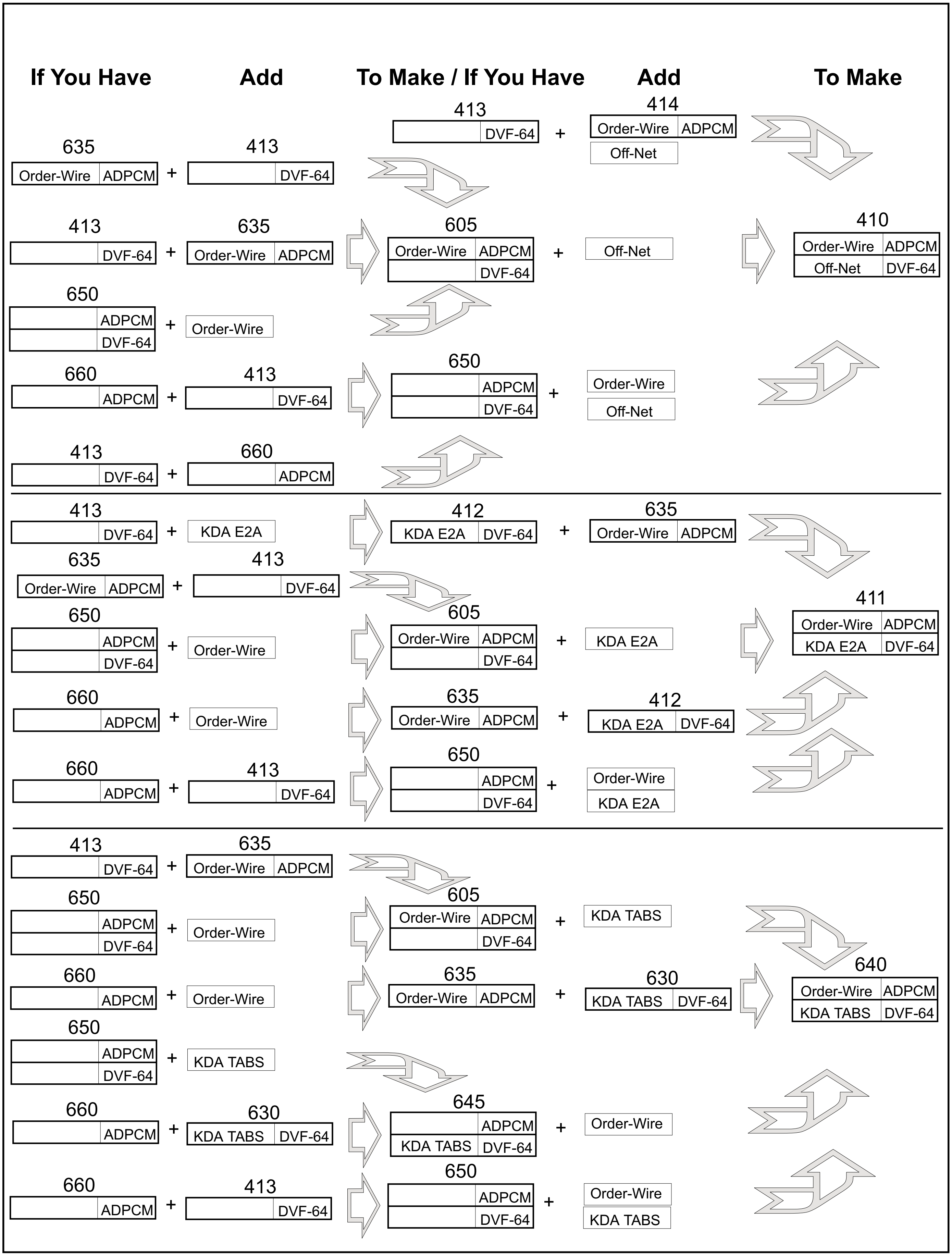
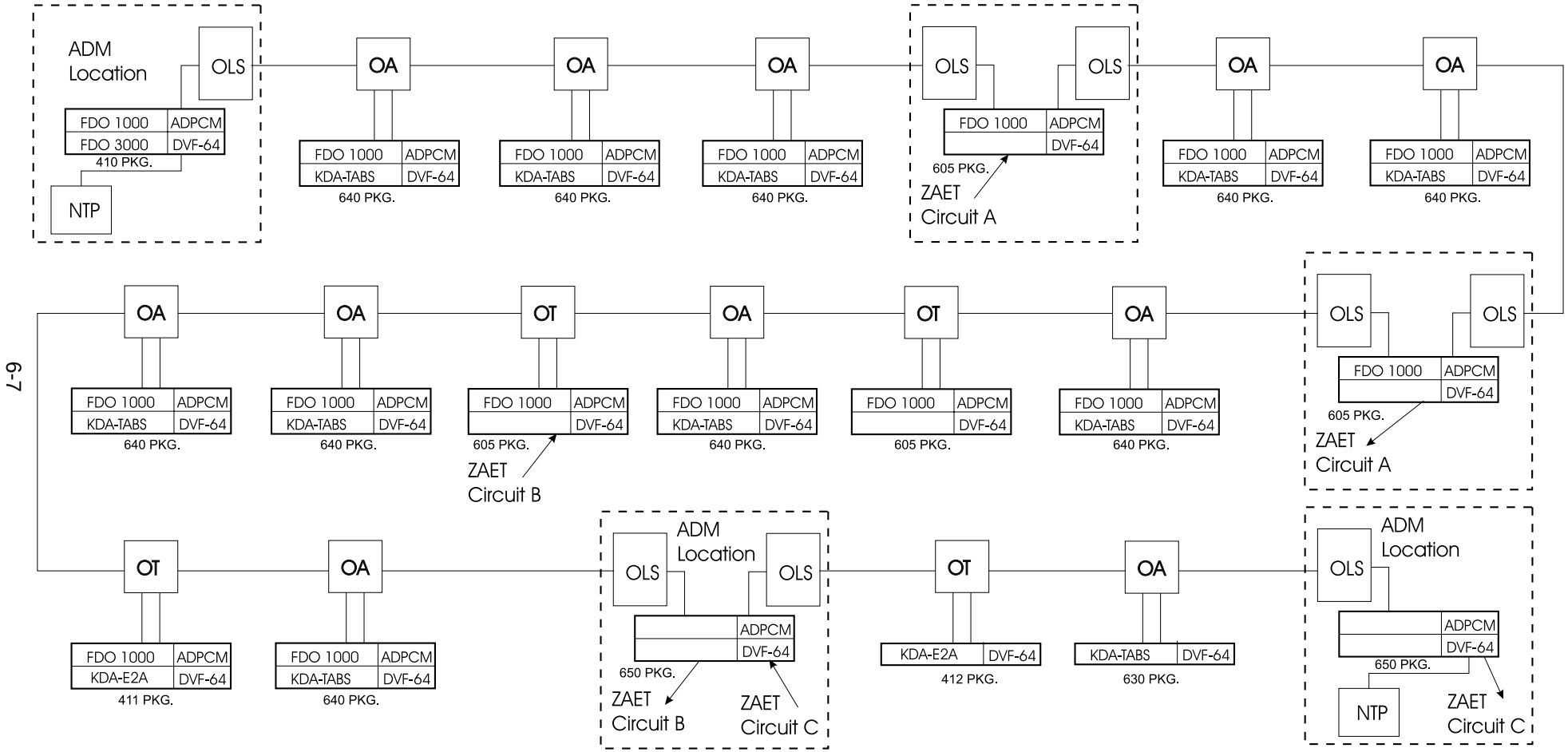


Fig. 8 - Packages can be expanded to make other packages.


ADM
Location
OLS
FDO 1000
ADPCM
FDO 3000
DVF-64
410 PKG.
NTP
OA
FDO 1000
ADPCM
KDA-TABS
DVF-64
640 PKG.
OLS
FDO 1000
ADPCM
DVF-64
605 PKG.
ZAET
Circuit A
OT
FDO 1000
ADPCM
KDA-TABS
DVF-64
605 PKG.
ZAET
Circuit B
KDA-E2A
411 PKG.
650 PKG.
ZAET
Circuit C
412 PKG.
630 PKG.

Glossary of Order-Wire and Alarm Remote Terms

ACO - Alarm cut off. Switch to silence an audible alarm. When the ACO is "on," the audible alarm device is silenced.

Alarm Point - A single discrete alarm input that requires a discrete (usually on-to-off or off-to-on) change in current flow or voltage to indicate a change of alarm condition from normal to alarm state. Assigned to a point number in a display and address. Usually reported to master as a single bit in a data stream.

Battery - Facility DC power. Normally supplied from a battery plant inside the office. Polarity is normally negative (positive ground) in a telecom facility.

Baud - The data transmission rate that the Com Port uses to talk to the equipment. Common data rates include: 1200, 2400, 4800, 9600, 19200 (19) and 38400 (38).

Change Of State - This is the condition of a point when it is in transition from one state to another. Change of State is abbreviated as COS.

Control Point - Relay isolated output that is controlled by command from the master. Normally-open (SPST) dry contacts are commonly used.

COS - This is the abbreviation for Change Of State.

Craft Port - Serial port for connection of a computer or ASCII terminal to test and modify configuration of the remote.

Database - A file containing records of organized and related information.

Displays - Displays contain 64 points of data.

Download - The act of transferring a configuration file from a computer to the KDA. Can be done remotely via the dial port (modem), if equipped, or locally via the craft port.

DTMF - The abbreviation for Dual Tone Multi-Frequency. This is a common touch tone telephone.

Expansion Card - Accessory card that fits into a slot at the right side of the KDA chassis. Adds additional functions to the host unit, such as the ADPCM and DVF-64 cards.

FDO - Model designation for DPS Telecom's order-wire product line. All products with this prefix are used with the order-wire.

KDA - Model designation for DPS Telecom's alarm remote / network element product line. All products with this prefix are alarm remotes.

LED - The abbreviation for Light Emitting Diode. The LED is used as an indicator of activity.

Modem - The abbreviation for Modulator/Demodulator. Modems are used to transfer data over telephone lines.

Off-net - A connection point in the order-wire network for the public switched telephone network (PSTN). Allows order-wire stations to have access for global communications.

Optically Isolated - Electrical interface, such as a discrete alarm point input, that isolates the external circuitry from the internal circuitry of the KDA with an optical coupler. Optical Isolation reduces the possibility of electrical mis-match or interference between the KDA and the alarm sources.

Order-Wire - Voice communications device for maintenance personnel. Often includes data for alarms and network management. Other terms are service channel and supervisory.

POTS - Plain Old Telephone Service. A 2-wire phone line to a central office switch.

Polarity - The polarity of a point can be either Normal (NRM) or Reverse (RVS). Normal polarity is current flow in a closed circuit for an alarm.

RTU - Remote Telemetry Unit. An RTU is a device that gathers alarm inputs and communicates them to a master alarm station.

Satellite - Additional KDA units at the same location and communicating with the master through a "base" KDA. Up to three satellites can be associated with a base KDA. Using satellites expands the use of a remote address, allowing greater system capacity.

TBOS - Telemetry-Byte-Oriented-Serial protocol. A well-established alarm system protocol used by many telco-oriented manufacturers. Normally embedded in switches, channel banks and other equipment with many alarm points. TBOS normally uses an RS422 serial port. A port has a capacity of 512 alarm points, divided into 8 "displays" of 64 points each.

Traffic - Activity on the line or channel.

Wire-Wrap - Wire connection points using a steel post that the connecting wire is wrapped around using a special tool.

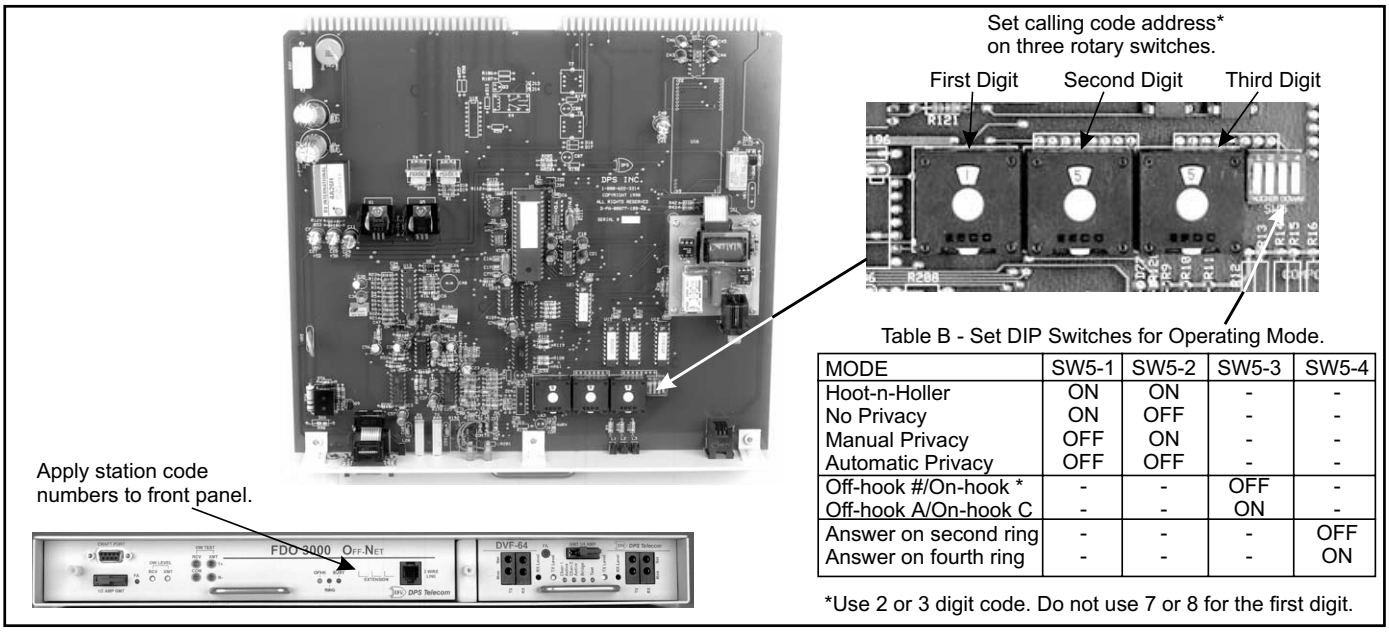


Table B - Set DIP Switches for Operating Mode.

MODE	SW5-1	SW5-2	SW5-3	SW5-4
Hoot-n-Holler	ON	ON	-	-
No Privacy	ON	OFF	-	-
Manual Privacy	OFF	ON	-	-
Automatic Privacy	OFF	OFF	-	-
Off-hook #/On-hook *	-	-	OFF	-
Off-hook A/On-hook C	-	-	ON	-
Answer on second ring	-	-	-	OFF
Answer on fourth ring	-	-	-	ON

*Use 2 or 3 digit code. Do not use 7 or 8 for the first digit.

Fig. 10 - Set off-net options before applying power.

Installation

1. Unpack the off-net and all accessories.
2. Install mounting ears for 23" or 19" rack. Position as required per Fig. 6.
3. Mount the off-net terminal in a rack below the order-wire.
4. Make sure the fuse is removed from the front panels of both the off-net and the DVF-64(if ordered).
5. Remove P.C. board from housing.
6. Connect all inputs and outputs per Fig. 7.
7. Install interconnecting cables per Figs. 7, 11 and 14.
8. Connect NTP or other TABS device at wire-wrap block, pins 5A thru 5D and 6A thru 6D (Fig. 7).
9. Connect E2A (202 modem) device or network at the wire-wrap block, pins 7A thru 7D (Fig. 7).
10. Connect power per Fig. 7.
11. Set station number on rotary switches.(Fig. 8)
12. Use a leading zero to set for 2 digit coding. (One digit coding will not work with an off-net.) Refer to Table A for code assignments.
13. Put station code numbers on front panel (Fig. 10).
14. Set DIP switch for operating mode per Fig. 10. (Factory default is "automatic privacy.")
16. Re-install P.C. board in housing.
17. Remove DVF-64 card from shelf (if ordered).
18. Check switch settings per Fig. 12.
19. Re-install DVF-64 card in housing.
20. Insert fuses at order-wire and DVF-64 (if ordered) front panels.
21. If this is a package equipped with an order-wire and ADPCM, the levels will be pre-set at the factory.
22. Perform a general test of the off-net by calling an outside phone and having an outside phone call back in to the site you are installing.
23. Installation is complete.

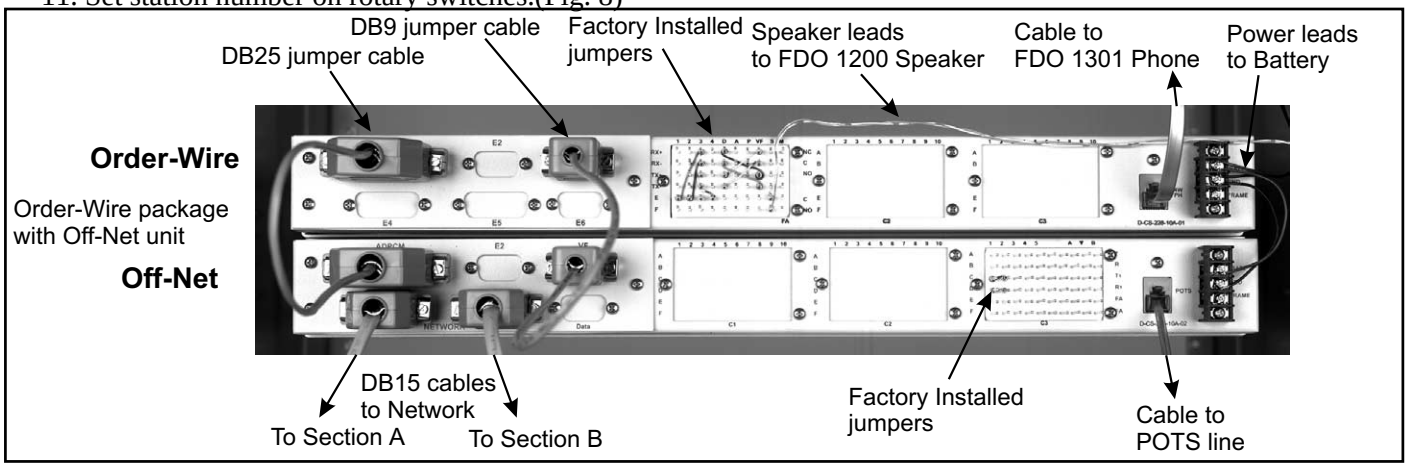


Fig. 11 - When installing an order-wire package, connect inter-shelf cables.

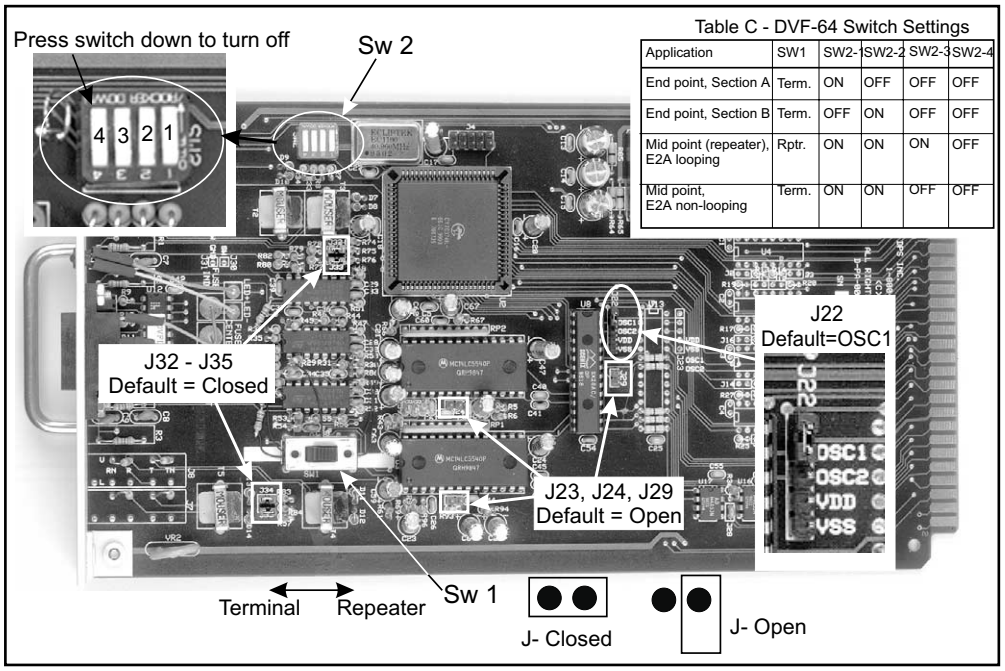


Table C - DVF-64 Switch Settings

Application	SW1	SW2-1	SW2-2	SW2-3	SW2-4
End point, Section A	Term.	ON	OFF	OFF	OFF
End point, Section B	Term.	OFF	ON	OFF	OFF
Mid point (repeater), E2A looping	Rptr.	ON	ON	ON	OFF
Mid point, E2A non-looping	Term.	ON	ON	OFF	OFF

Fig. 12 - Set Terminal / Repeater switch on the DVF-64 card.

Table D - Dial Code Assignments

Code	Assignment
010 thru 099*	Two digit dialing. Leading zero is not dialed.
100 thru 799; 900 thru 999*	Three digit dialing.
777	All call ((does not work with Off-Net)

***Avoid using codes that start with "8."**

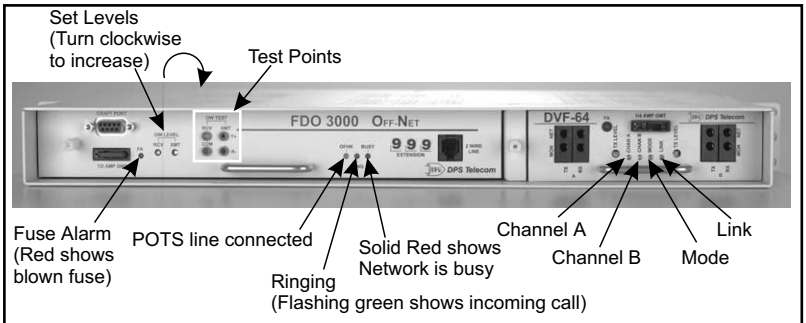


Table E - DVF-64 Led Meanings

LED	Color	Meanings
Channel A	OFF	Channel Off
	Solid GRN	Channel active
	Flashing GRN	Loss of transmit sync
	Flashing RED	Loss of receive sync
	Flashing RED/GRN	Loss of both channels
Channel B	OFF	Channel Off
	Solid GRN	Channel active
	Flashing GRN	Loss of transmit sync
	Flashing RED	Loss of receive sync
	Flashing RED/GRN	Loss of both channels
Mode	OFF	Repeater switch Off
	Solid RED	Repeater switch On and bridged
Link	OFF	No TABS
	Flashing GRN	64 Kbit section A active
	Flashing RED	64 Kbit section B active
	Flashing RED/GRN	Both sections being polled
FA	Solid Red	Blown Fuse

Fig. 13 - LEDs on DVF-64 show channel status.

Operation

A. Calling out from an order-wire terminal:

1. Lift phone from cradle and dial the 2 or 3 digit code for the off-net.

2. Dial tone will be returned from the outside line. The OFF HOOK LED on the off-net front panel will illuminate.

3. Dial outside number. All outside tones (ringback, busy) will be heard.

4. When conversation is over, hang up the order-wire phone. The off-net connection will be terminated. The OFF HOOK LED on the off-net front panel will go out.

B. Calling in to the order-wire from an off-net phone:

1. Dial the 7 or 10 digit number for the off-net terminal.

2. The RING LED on the off-net front panel will flash. The off-net will answer after the second ring. The OFF HOOK LED on the off-net front panel will illuminate. You will hear dial tone from the order-wire.*

3. Dial the 1, 2 or 3 digit code for the desired order-wire station. You will hear ring-back from the order-wire.

4. When the conversation is over, hang up the phone. The off-net connection will be terminated. The OFF HOOK LED on the off-net front panel will go out.

**NOTE: If the order-wire network is busy, you will hear a busy tone, followed by a disconnect.*

NOTE: Because the off-net connection is 2-wire, an echo can be produced on the order-wire network if more than two off-net lines are active at the same time.

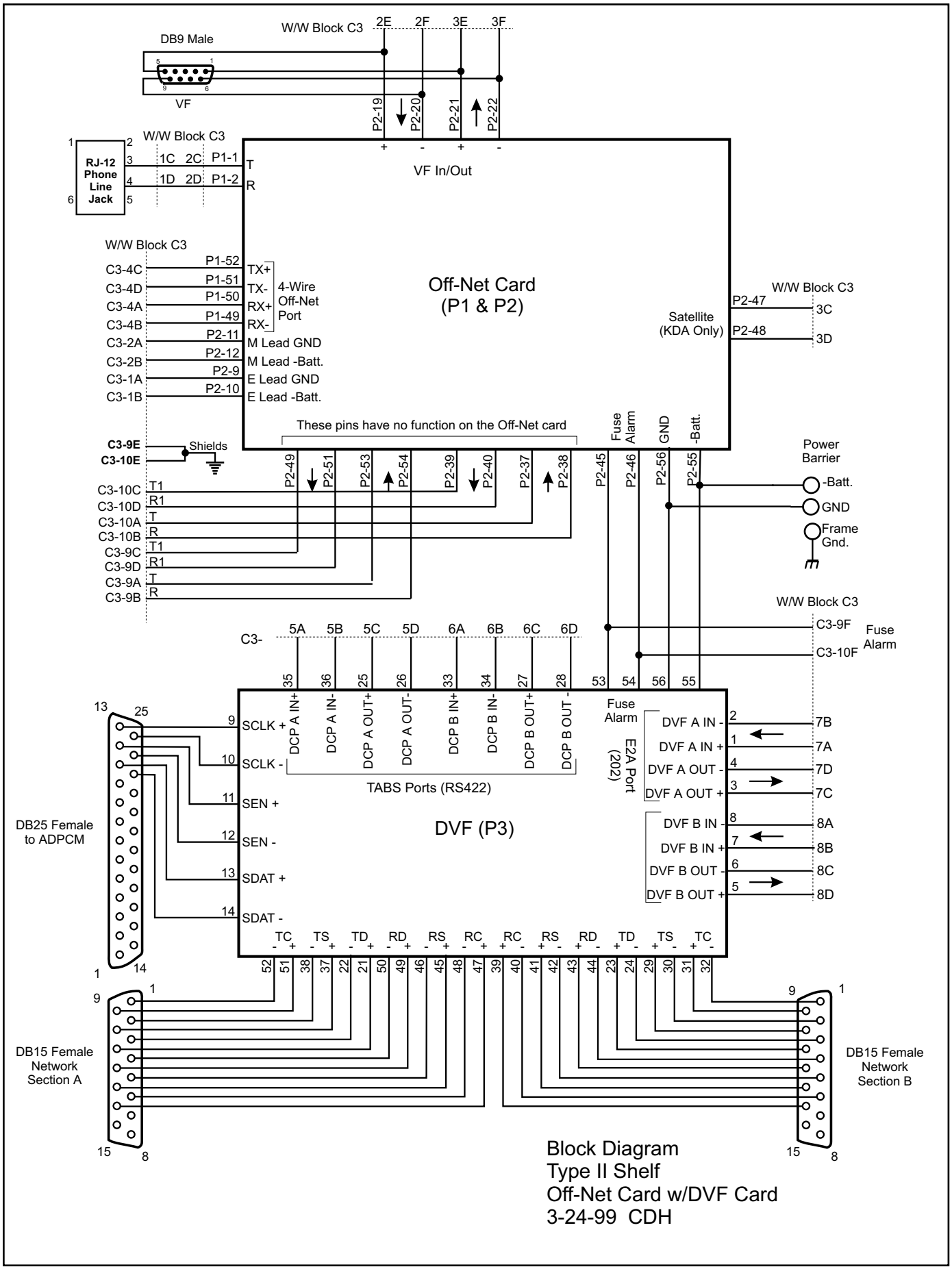


Fig. 12 - Off-net package is pre-wired for digital application.

Specifications

2-Wire Return Loss: >40 dB

2-Wire Trans-Hybrid Loss: >38 dB

Frequency Range: 300 to 3000 Hz

Physical Size: 1-3/4" X 19" X 12" case

Weight: 3 lbs

Voltage Range: Option 0 = -18 to -72 VDC
Option 2 = -18 to -36 VDC
Option 4 = -36 to -72 VDC

Current: 200 mA

Fuse: 1 Amp

Levels

Order-wire channel: -26 to -3 dBm

Off-net Port, 4-wire: -26 to -3 dBm Transmit
-26 to -3dBm Receive

Off-net Port, 2-wire: -9 dBm

FCC Part 68: The off-net uses a commercially produced coupler circuit that is part 68 approved.

FCC Reg. number: 2FKusa-73217-VP-N

Connector: RJ-11c connector

Ringer equiv: 0.0B

DVF-64

Dimensions: 5.375” W x 1.6” H x 10.7” D

Mounting: Expansion card slot in KDA type housing

Input Voltage Range:
Option 0 = -18 to -72 VDC (wide range)
Option 2 = -18 to -36 VDC (- 24 V nominal)
Option 4 = -36 to -72 VDC (-48 V nominal)

Input Current: 400 ma @ 24 V
200 ma @ 48 V

Heat Dissipation: 32.8 BTU @ 24 or 48V

Operating Temperature Range:
0º to +60º C

Humidity: 0% to 95% non-condensing

VF Levels: -16 to +7 dBm

VF Return Loss: >40 dB

VF trans-hybrid loss:
>56 dB

VF frequency range: 300 to 4000 Hz

Shipping weight: 12 oz

Options and Model Numbers

FDO-3000-10A-0V Off-Net Order-Wire Interface

Options: V: 1=120VAC, 2=-24VDC, 4=-48VDC;

Replacement card (48 volt):
D-PC-801-11C-04

Companion order-wire

FDO-1000-10A-0V VF Order Wire (w/o phone)

Options: V: 1=120VAC, 2=-24VDC, 4=-48VDC;

Replacement card (48 volt):
D-PC-802-11C-04

Accessories

FDO-1200-10A-00 External Speaker, Wall Mount

FDO-1301-10A-00 Trimline Phone w/DTMF Dial, 4-wire, beige

FDO-1301-10A-01 Trimline Phone w/DTMF Dial, 4-wire, white

FDO-1501-10A-00 Active 4 way / 4 wire Bridge

Table F - Packages that use the FDO 3000 Off-Net

Part Number	Package Name	Components	Manuals for companion elements
D-PG-410-11C-00	Terminal Order-wire with Off-Net.	FDO 1000/ Phone / Speaker / ADPCM FDO 3000 / DVF-64 (2 shelves)	UM110339
D-PG-414-11C-00	Order-wire Expansion Package with Off-Net (card only). Add to 413 package to make a 410 package.	FDO 1000/ Phone / Speaker / ADPCM FDO 3000 (1 shelf)	UM110339

NOTE: Fig. 8 shows how packages can be expanded.

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