Information Note
FXS and FXO
## useful information

FXS vs FXO.

In loop start analogue telephony there are two types of interface, FXS and FXO.

An FXO device plugs into an FXS line.
- Standard analogue phones are FXO devices.
- PBX extension interfaces that you plug analogue phones into and CO lines are FXS.

FXS devices supply 48 volts to the line, FXO devices may use this line voltage to power themselves.

Vegas are available with both types of interface.

Vega 50 FXS
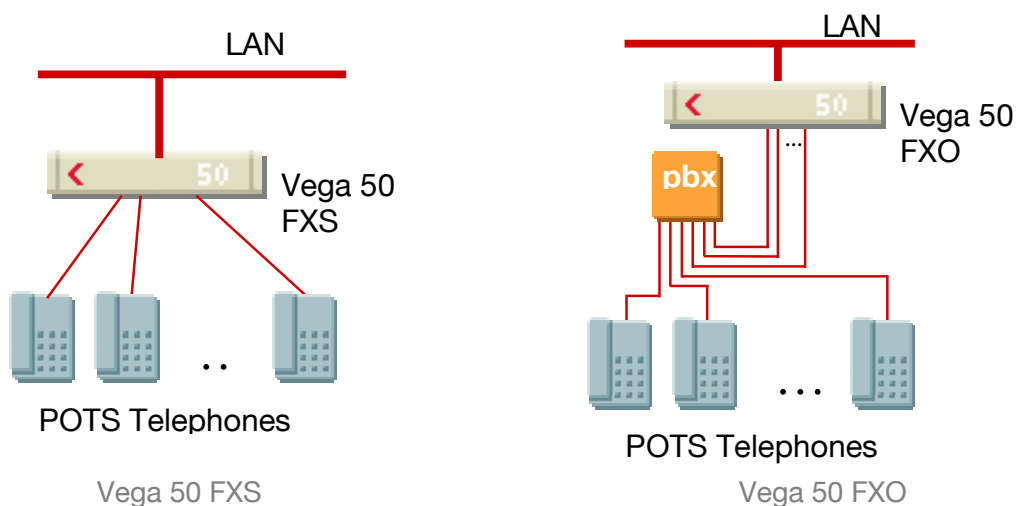
Vega 50 FXO

To understand the capabilities of each it is useful to think of the Vega 50 FXS being like an 8 port PBX and the Vega 50 FXO being like a bank of 8 virtual telephones.

Vega 50 FXS   Vega 50 FXO

Ringing

Seize Line
Dial DTMF digits
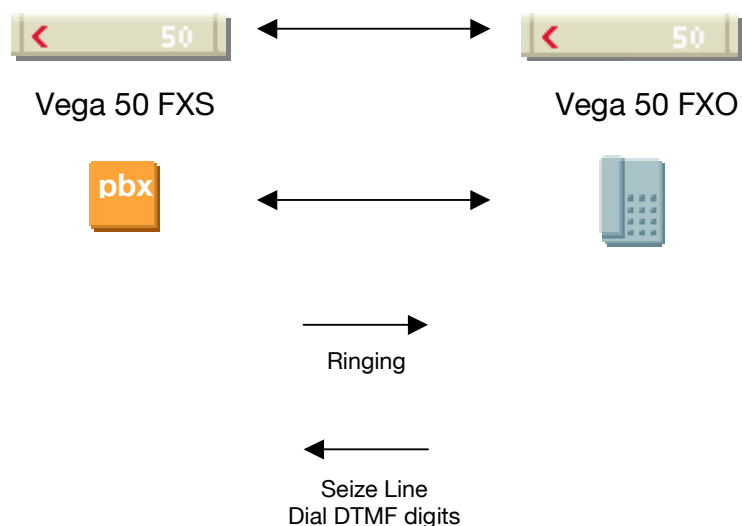
The FXO unit (c.f. telephone)

A Vega 50 FXO makes a call by:
- ➤ Seizing the telephone line (going off hook)
- ➤ Dialing DTMF digits to identify the destination to call

A Vega 50 FXO receives a call by:
- ➤ Identifying when ringing voltage is being supplied by the PBX / CO switch (just like a telephone no dialed numbers can be passed to it - the dial planner must be programmed to make its routing decisions based on the physical port that the call arrives on and the Caller ID (if available)).
- ➤ Answers the call by "going off hook".

The Vega 50 FXO can clear the call down (by going on hook) at the end of the call.

Typically PBX / CO switches cannot request the FXO device to clear the call down. However, there are two techniques that some PBXs use to indicate the end of a call:
- ➤ "loop current disconnect" aka "battery voltage disconnect" and
- ➤ "line current reversal" aka "battery voltage reversal"

Vega FXO units can be configured to detect either of these end of call indications, when detected they will cause the Vega to clear the call.

The FXS unit (c.f. PBX)

A Vega 50 FXS makes a call by:
 ➢ Presenting ringing voltage to the line (attached device) – just like a PBX it does not / cannot pass any dialed digits. CLI (if available and enabled) will be presented.

A Vega 50 FXS receives a call by:
 ➢ Identifying that the line has been seized (the attached telephone – FXO device – has gone off hook)
 ➢ Receiving DTMF digits that define how to route the call.

Typically FXS devices do not indicate when they want to clear a call down, they rely on the two parties noticing that the call has ended (through the other party saying goodbye or the line going quiet) and each end device clearing itself down.

Vega 50 FXSs however can be configured for line current reversal operation, and in this case both answer and cleardown indications are given by the reversing of the polarity of the line.

Using analogue Vegas for PBX toll bypass

From the descriptions above we can see that analogue telephony puts limitations on the information passed when an analogue call is made. Generally an FXO device is good at outdialing (and passing on the dialed number) where as an FXS unit is good at receiving calls (receiving the DTMF digits).

So if two PBXs are to be connected together using a VoIP link, it is best to use both FXS and FXO units. At each PBX an FXS unit is connected to the PBX's analogue trunk lines and calls to be made to the destination PBX are routed this way. Calls are then routed from the Vega 50 FXS to a Vega 50 FXO connected to standard telephone ports on the PBX to allow the dialed number to be passed into the PBX.
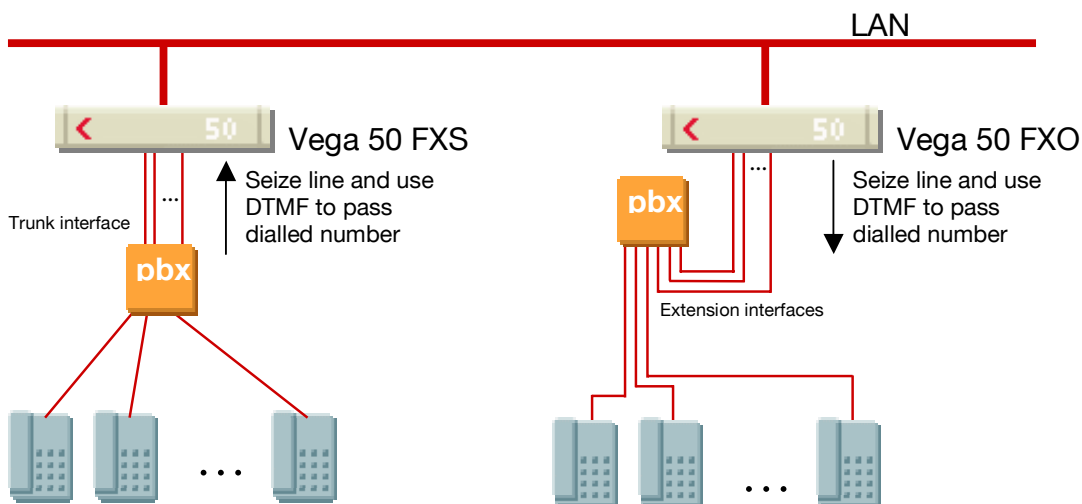
Note that if calls are presented at the PBX's trunk interface, (as it is an FXO interface) it cannot receive dialed digits, so calls will either be routed to the operator, or an auto-attendant.

Alternative Direct Dialing.

If use of an FXS unit and an FXO unit at each site is not appropriate, then there is a way around it using PBX functionality and FXS units. The solution is to use two Vega 50 FXSs, one connected to each PBX, on its trunk interface.

When a call is to be made, the originating PBX must dial an access code to the Vega, pause then dial the routing digits. (This can be pre-programmed or made a requirement of the user making calls across this link).

In this scenario, dialing the access code to the Vega will trigger it to make a call to the destination PBX. The destination PBX answers the incoming call either with an auto-attendant, or secondary dial tone – to allow the routing digits to be received. Then the originating PBX dials the routing digits (using DTMF). At this stage the DTMF digits are passed from Vega to Vega in a clear audio channel.

e.g. if the destination number required is 4287, and the access code for the destination site is 7, then the caller dials 74287. The PBX will dial the 7 pause then dial the 4287. The far end PBX will only receive the DTMF digits 4287.

Note, by using different access codes (e.g. 7,8,9 etc) at the start of the number the Vega 50 FXS connected to the originating PBX can route calls to different destination Vega units.

Only extension ports available on the PBX

If only extension ports are available on the PBX, it is not possible to support Direct Dialling, but calls can still be made.
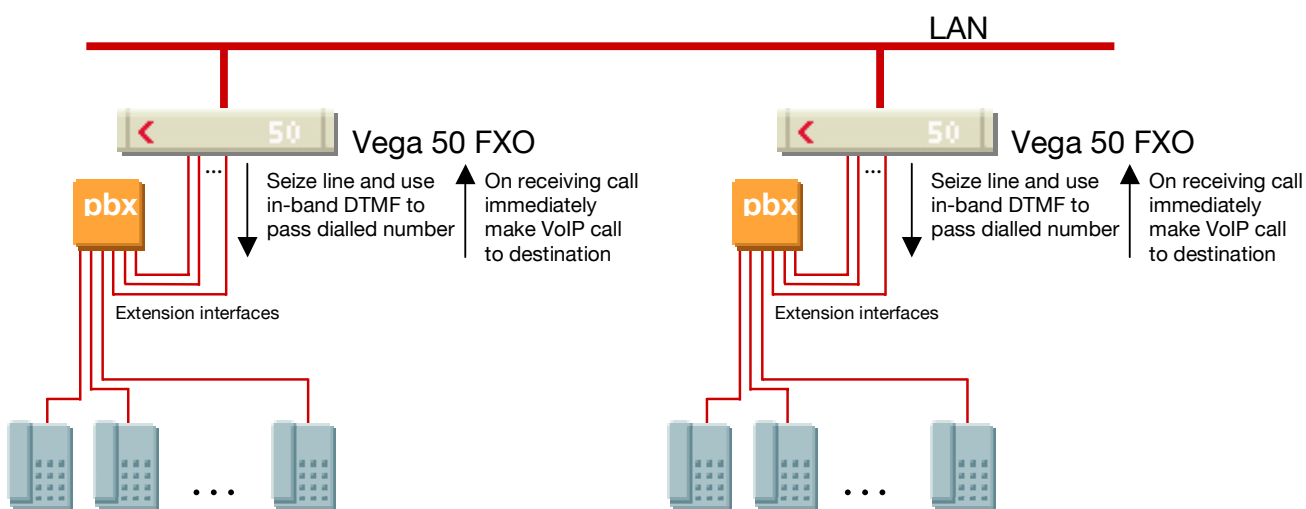
When making a call from one PBX to another, dial an extension interface that connects to a Vega FXO port. The Vega will be configured to see this call arrive and immediately make a VoIP call to the destination gateway. This destination gateway will seize the line into the PBX, so the originating caller will now hear the far end PBX dial tone. The caller can then dial any number that they could if they were calling from a phone connected directly to that far end PBX.