

## DID Telephone Lines General Info

This document provides information about what DID lines are, how they work, and how to order them from your telephone company.

A DID trunk is a trunk powered by the customer. This is reverse of normal phone lines (called POTS line which stands for Plain Old Telephone Service) where the phone company supplies the power. This is why you still have phone service at home when the power is out. A DID customer must supply -48 volts to provide "talk battery". This is the current modulated to produce audio. It is shown as -48 instead of +48 to indicate that it requires polarity a certain way with respect to the Tip and Ring wires.

With DID lines there are two ways for the central office (CO) to signal the customer equipment of a new call : Loop-Start and Ground-Start.

A) With Loop-Start, the tip and ring wires are connected through a high impedance connection at the CO until a call comes through. At such time, the Tip and Ring are connected with little or no resistance and current flows. The customer equipment detects this current flow and knows a call is starting.

B) With Ground-Start, the tip or ring is pulled to ground when a call is started and the customer equipment detects the loop current between ring and a natural ground, thus knowing a call is started.

Neither Brooktrout nor Gammalink support Ground-Start trunking, so Loop-Start trunking is necessary. This is not to be confused with a POTS line which we refer to as a Loop-Start line.

Once a call is started, handshaking can be done one of two ways: Wink or Immediate. With immediate, the CO waits a specified time (approximately 1.5 to 2 seconds) after call starting and simply sends down the DID digits. With Wink start, the CO call starts and then waits to see a momentary polarity reversal (a wink) indicating that the customer equipment is ready for the DID digits. If the CO doesn't see the wink after 5 to 10 seconds, it will return a re-order busy (fast busy) to the caller.

After handshaking, the CO will send a fixed number of digits to the customer equipment using either Pulse or DTMF (Dual-Tone, Multi-Frequency). Pulse is slow and unreliable as pulses can be misinterpreted, so DTMF is recommended. By the way, a pulse is simply a momentary interruption in loop current, so it can be difficult to differentiate among a hang-up, a pulse, and line noise. If the expected number of digits is not received after 8 to 10 seconds, the customer equipment can return a re-order busy to the caller. Note that the caller is able to hear such a busy signal, but they will not hear the digits being sent from the CO to the customer equipment as that signal echo is suppressed. However, sometimes if you listen closely you can hear the DTMF digits being sent from the CO to the customer equipment -- then you will here the loud squeal of the fax carrier tone.

If in Wink mode, and after the expected number of digits is received, the polarity is reversed by the customer equipment and the call is fully connected. At this point, the fax card will fire off an interrupt to the fax drivers indicating a ring signal. Our thread, having been blocked waiting for a ring interrupt, is now eligible for CPU cycles and we almost immediately start up the fax modem, thus turning on the carrier signal (the really loud squeal).

After the call completion and if we are in Wink mode, we flip back the polarity to its original state and go back to waiting for a call start. If in immediate mode, we simply go back to a call waiting state.

The CO switch can elect to not send calls through to the customer if any of the following conditions occur: no current detected on the tip and ring; inversed polarity in the call waiting state; or, after call start the customer fails to wink. When this happens, the trunk is considered to be in a "down" state and a service call must be placed to have the trunk "turned up" or back on. When a trunk is "downed" the CO switch returns a re-order (fast) busy to any callers without attempting to talk to the customer equipment. The theory here is that the CO doesn't want to waste time attempting to talk to downed customer equipment. A down trunk also throws off an alarm at the CO office and shows up on an exception report. Some CO's will periodically attempt to turn-up any downed trunks in the case that the customer has fixed their problem recently, so sometimes you don't have to call service, you just have to wait a while.

Here are the DID telephone service options along with the recommended configuration:

Trunk Type: Loop Start  
Service Type: Wink Type  
Signaling: DTMF  
Digit Length: Four