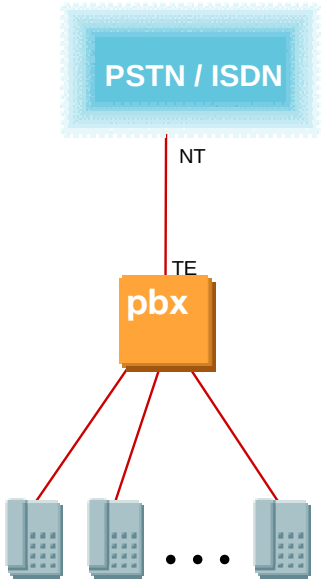
Information Note
Connecting a T1 / E1 - checklist

When connecting a Vega to a T1 or E1 connection there are a number of steps that need to be followed in order to ensure that the link will come up and the system will operate correctly.

Trunk interface (DSL) configuration

For T1 / E1, an NT – NeTwork – device must be connected to a TE – Terminal Equipment – device; NT must connect to TE.

For example the PSTN/ISDN will be NT – NeTwork – and the trunk interfaces of a PBX will be TE – Terminal Equipment.



For a Vega to operate correctly, it must have its trunks configured NT / TE appropriately; NT if it is to connect to a TE device and TE if it is to connect to an NT device.

By default Vega gateways are configured with alternate trunks configured TE and NT, IF:01 = TE, IF:02 = NT, … etc. so often it is possible to use default Vega configuration.

(If you need to change the configuration, see the appropriate step-by-step initial configuration guide)

Framing

E1:

Ensure that on the web browser DSL page that the choice of CRC4 / PCM30 (no CRC4) is made. This is a per-unit value and so only needs to be made once.

Typically CRC4 should be selected – as per the Q.931 specification.
In France and Sweden (and occasionally elsewhere, e.g. on Alcatel PBXs) CRC4 is not used, and PCM30 should be selected.

T1:

Ensure that on the web browser DSL page that the choice of ESF / SF is made. This is a per-unit value and so only needs to be made once.

ESF is the more modern and more commonly used framing. This is typically used with B8ZS line encoding.

Network type and other parameters

See a relevant step-by-step initial configuration guide

Hardware connectivity

Use the diagrams in Annex 1 to correctly wire in your Vega 400 or Vega 100.

Note Vega 100 uses different cables depending on whether a trunk is being connected to an NT or a TE device. Vega 400 however carries out the pinout switching internally and so only 1 type of cable is required. N.B. Do Not use Vega BRI cables – the pinout is completely different to PRI cables.

The 'L2' LEDs on the Vega 400 and the 'channel' LEDs on the Vega 100 indicate the connectivity status of the line.

- If the LED is off – there is either no cable connection, or the cable is wrongly wired.
- If the LED is flashing, layer 1 (the physical layer) has connected OK, but signalling layer 2 has not connected properly.
- If the LED is solidly on then the signalling layer 3 has connected correctly.

Bus master

In order to keep synchronised the Vega should synchronise itself with a master clock – typically the PSTN clock. Generally TE trunks receive the clock and NT trunks are 'clock masters'.

If a Vega trunk is not synchronised, then there will be 'SLIPs' – to check for SLIPs, use 'show ports'. One or 2 slips often occur at start up – this is acceptable; if the slip count keeps increasing, there is a problem that needs to be resolved.

See Information Note 'IN03 – ISDN clocks' for details about how to configure clocking and Bus Master.

Layer 1 codec

T1:

By default the layer 1 codec is set to g711alaw64k (for E1), ensure that this is configured for g711ulaw64k.

Channel allocation

In an E1 or T1 trunk there are multiple (30, 24, 23) channels. When a call is placed a channel is selected to be used to pass the audio.

If a call is being placed by the Vega at the same time that a call is being received by the Vega, ideally the calls should choose different channels to use for their audio.

Details of configuration can be found in the step-by-step guide 'insert Vega between PSTN and PBX'

Fractional E1 / Fractional T1

In some installations, not all channels of a trunk are enabled for use. If this is the case the Vega should be configured with this information so that it does not try to use channels that are not active.

Details of configuration can be found in the step-by-step guide 'insert Vega between PSTN and PBX'

T1 CAS: Info, RX Dial Format String and TX Dial Format String

These three parameters allow the format of the incoming tones and outgoing tones that specify dialled number and optionally ANI (calling party number) to be configured.

Info may be configured as dtmf or mf. This defines the tones to be used (frequencies etc). This must match the tone style being used by the device to which the Vega is being attached.

RX Dial Format String and TX Dial Format String represent the sequence of tones to be used. Vega gateways have built in default settings, and these are indicated by the RX / TX Dial Format String being set to '.'

Details of configuration of RX / TX Dial Format Sting can be found in the Vega Primer

Only Signal mode = fgd (which is e & m signalling with the feature group D extension) supports ANI as well as dialled number – the other schemes only support dialled number.

If it is not clear what digits and delimiters are being sent to the Vega, once Info has been set correctly, the following debug can be used:

- debug enable _CAS i
- debug on

See Annex 3 for an example output.

Note: The RX Dial String format and the TX Dial String Format may not be the same

Long haul / short haul and equalization settings

Vega gateways have the capability to adjust the line drive parameters (T1) and receive sensitivity (E1).

These seldom need to be altered, but for full details on how and when to configure them, see the Vega Primer:

- For T1, look at the section titled: 'Guidelines for configuring t1_tx_equalization'
- For E1, look for the section titled 'E1 line matching'

Note: the T1 parameter does not affect E1 operation and the E1 parameter does not affect T1 operation.

License key

On Vega 400 gateways ensure that the license key indicates that E1 is enabled for E1 connectivity and that T1 is enabled for T1 connectivity. Also check that the required codecs are enabled.

Further configuration

To configure your Vega for use, see the appropriate step-by-step initial configuration guide and / or the step-by-step guide 'insert Vega between PSTN and PBX'

Trouble-shooting

RAI – Remote Alarm Indication on PBX
If the PBX shows a Remote Alarm Indication and layer 1 doesn't come up, try changing the CRC4 / PCM30 setting.

No physical connection (LED off)
- check that NT is connected to TE and TE is connected to NT
- check whether a crossover is needed
- check exact cabling pinouts
  Rx+ connects to TX+
  Rx- connects to TX-
  Tx+ connects to Rx+
  Tx- connects to Rx-
- on E1 systems, check that CRC4 framing is selected if CRC4 is required and PCM30 if CRC4 is not required
- check a LOG display on for errors like the Vega detecting both ends NT or both ends TE
  - if still problems take an ISDN trace (see Annex 2) – especially look for SABMEs

… see also 'Incorrect socket wiring' section (below)

No layer 2 (LED flashing)
- take an ISDN trace (see Annex 2) – especially look for SABMEs

Layer 2 up (LED on), call disconnects with error code 38
- check that the call is being routed to a trunk that is 'up'

Layer 2 up (LED on), outgoing call to ISDN is rejected by the network
- check that the caller ID being presented in the outgoing ISDN call is a valid caller ID for that trunk. Some network operators check the caller ID on outgoing calls and reject calls if an invalid caller ID is being presented (other network operators just over-stamp caller ID with the Trunk caller ID).

Layer 2 up (LED on), some calls work, others don't
- take an ISDN trace (see Annex 2) – especially look for differences in the SETUP (and other) messages between working and non-working calls.
- for instance
  - Channel ID preferred / exclusive – choice sometimes matters (see _advanced.isdn.chanid_excl)
  - Type of Number, Numbering Plan, and screening information can be important – generally these should be configured as 'supplied' so that they are passed through from inbound call to outbound call. They can be overriden on a per trunk basis (advanced > setup_mapping > called party number / calling party number) or on a per call basis (planner.post_profile)
  - Bearer capability – generally this should be passed through but it can be overriden on a per trunk basis (advanced > setup_mapping > bearer capability).

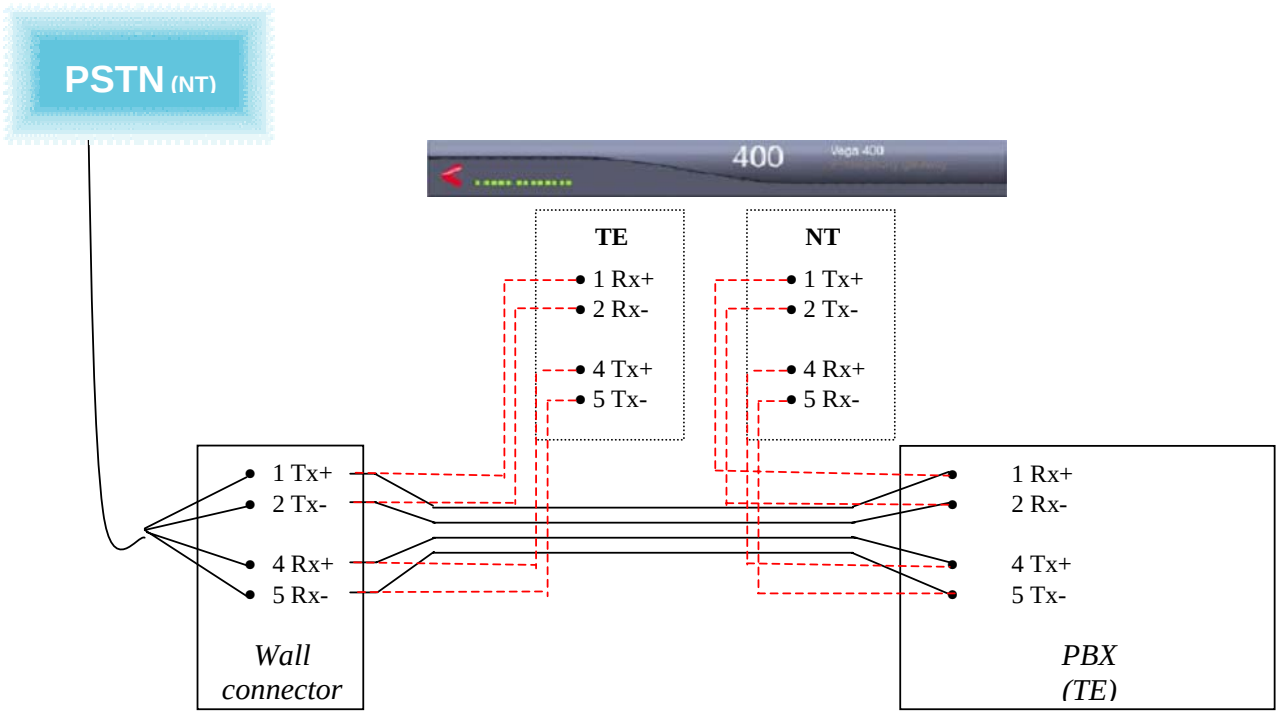
Incorrect socket wiring
A socket can be diagnosed as being incorrectly wired / requiring a different crossover cable between the Vega and the socket if the following symptoms are observed:
- Device to connect to is NT:
  - with the cable plugged into a TE port on the Vega, Layer 1 does not come up (LED remains off)
    (Physically Tx is connected to Tx and Rx to Rx)
  - with the cable plugged into an NT port (instead of TE), Layer 1 comes up (LED flashes)
    (Physically Tx is correctly connected to Rx and Rx to Tx, but both ends are NT)
    Vega may display error log 'DSL port x: SABM/SABME/DISC Frame error; check the NT/TE setting'

  ACTION: *swap Tx and Rx in the cable or on the wall socket and connect to the TE port of the Vega*
- Device to connect to is TE:
  - with the cable plugged into an NT port on the Vega, Layer 1 does not come up (LED remains off)
    (Physically Tx is connected to Tx and Rx to Rx)
  - with the cable is plugged into a TE port (instead of NT), Layer 1 comes up (LED flashes)
    (Physically Tx is correctly connected to Rx and Rx to Tx, but both ends are TE)
    Vega may display error log 'DSL port x: SABM/SABME/DISC Frame error; check the NT/TE setting'

  ACTION: swap Tx and Rx in the cable or on the wall socket and connect to the NT port of the Vega

Annex 1

Physical connectivity of a Vega 400



Cable pinouts

Cables with RJ48 plugs are used to connect to the Vega 400's ISDN ports. The pinout of each Vega 400 interface automatically changes from NT to TE depending on the configuration setting in the Vega. A (RED) straight through cable is used to connect an NT Vega DSL to a TE far end device, and the same (RED) straight through cable is used to connect a TE Vega DSL to an NT far end device.

Vega 400 PRI	Far end device	Far end device
NT (physical)	TE	TE
1 (Tx+)	1 (Rx+)	4 (Rx+)
2 (Tx-)	2 (Rx-)	5 (Rx-)
4 (Rx+)	4 (Tx+)	3 (Tx+)
5 (Rx-)	5 (Tx-)	6 (Tx-)
	VegaStream provided cables (ISO 10173)	ISO 8877

Vega 400 PRI	Far end device	Far end device
TE (physical)	NT	NT
1 (Rx+)	1 (Tx+)	4 (Tx+)
2 (Rx-)	2 (Tx-)	5 (Tx-)
4 (Tx+)	4 (Rx+)	3 (Rx+)
5 (Tx-)	5 (Rx-)	6 (Rx-)
	VegaStream provided cables (ISO 10173)	ISO 8877

For Loopback between a Vega NT port and a Vega TE port, use the RED cable

Annex 2

ISDN trace

Follow the guidelines in the Information Note ‘IN 04 - Low level ISDN trace’ to take the trace.

If there are link start up problems, look for SABMEs
Both NT and TE devices should send SABMEs, though typically NT devices will send the SABME earlier than the TE device.

Within the SABME there is a command_response bit.

- For a SABME sent NT to TE, the command_response bit =1
- For a SABME sent TE to NT, the command_response bit =0

A SABME should be responded to with a UNNUMBERED ACK.

Once the link is up, layer 2 RECEIVER READY messages should be seen. These can be initiated by both NT and TE devices. They should be responded to immediately by a RECEIVER READY message from the other device.

- For a RECEIVER READY command sent NT to TE, the command_response = 1
- For a RECEIVER READY command sent TE to NT, the command_response = 0
- For a RECEIVER READY response sent NT to TE, the command_response = 0
- For a RECEIVER READY response sent TE to NT, the command_response = 1

Annex 3

CAS trace

Example output showing caller ID ‘0104’, dialled number ‘1234’ and *delimiting the numbers. This requires an RX Dial Format String value ‘*o*n*’

```
; turn off any old debug
admin  >debug disable all 0xff
admin  >debug disable _all 0xff
; re-enable errors and fatals
admin  >debug enable all ef
admin  >debug enable _all ef
; enable CAS debug
admin  >debug enable _CAS i
admin  >debug on
debug to this console = enabled
_CAS      :Info  : 4152114: 1258262:TN      :DSL 1, CAS signal change   :(vspli.c;1772)
_CAS      :Info  : 4152434: 00320:ISDN    :CAS_ProcessToneEvent(): DSL(0) Ch(01) Ready
BACKWARD_TONE    :(api_cas.c;394)
_CAS      :Info  : 4152434: 00000:ISDN    :CAS_ProcessEvent(): SEIZE    :(api_cas.c;137)
_CAS      :Info  : 4152434: 00000:ISDN    :CAS_ProcessEvent(): SETUP    :(api_cas.c;143)
_CAS      :Info  : 4152439: 00005:ISDN    :CAS_SendCallProceeding(00000001)
:(api_cas.c;666)
_CAS      :Info  : 4152934: 00495:ISDN    :Received DTMF '*' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4153084: 00150:ISDN    :Received DTMF '0' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4153084: 00000:ISDN    :CAS_IncomingTone :cb 80f45668 ANI 0
:(api_cas.c;1170)
_CAS      :Info  : 4153234: 00150:ISDN    :Received DTMF '1' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4153234: 00000:ISDN    :CAS_IncomingTone :cb 80f45668 ANI 01
:(api_cas.c;1170)
_CAS      :Info  : 4153384: 00150:ISDN    :Received DTMF '0' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4153384: 00000:ISDN    :CAS_IncomingTone :cb 80f45668 ANI 010
:(api_cas.c;1170)
_CAS      :Info  : 4153534: 00150:ISDN    :Received DTMF '4' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4153534: 00000:ISDN    :CAS_IncomingTone :cb 80f45668 ANI 0104
:(api_cas.c;1170)
_CAS      :Info  : 4153684: 00150:ISDN    :Received DTMF '*' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4153834: 00150:ISDN    :Received DTMF '1' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4153834: 00000:ISDN    :CAS_IncomingTone :cb 80f45668 DNIS 1
:(api_cas.c;1185)
_CAS      :Info  : 4153984: 00150:ISDN    :Received DTMF '2' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4153984: 00000:ISDN    :CAS_IncomingTone :cb 80f45668 DNIS 12
:(api_cas.c;1185)
_CAS      :Info  : 4154134: 00150:ISDN    :Received DTMF '3' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4154134: 00000:ISDN    :CAS_IncomingTone :cb 80f45668 DNIS 123
:(api_cas.c;1185)
_CAS      :Info  : 4154284: 00150:ISDN    :Received DTMF '4' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4154284: 00000:ISDN    :CAS_IncomingTone :cb 80f45668 DNIS 1234
:(api_cas.c;1185)
_CAS      :Info  : 4154434: 00150:ISDN    :Received DTMF '*' (04)       :(is_cassm.c;287)
_CAS      :Info  : 4154437: 00003:ISDN    :CAS_ToneAddrDone(00000001)   :(api_cas.c;699)
```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