# HARDWARE DESCRIPTION
# OF
# THE 2TP_VME_LA MODULE

ELECTRONIC DEPARTMENT
NIKHEF-H, AMSTERDAM

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**CONTENTS:**



**ELECTRONIC DEPARTMENT, NIKHEF-H, AMSTERDAM, SEPTEMBER 1990.**
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## 1. INTRODUCTION:

The 2TP-VME-LA module provides each transputer of the 2TP-VME module with:

- four 10-pin connectors, named resp. 'LINKX0 - X3' and 'LINKY0 - Y3', each containing:
  - 1 buffered RS 422 LINK-OUT connection \
  - 1 buffered RS 422 LINK-IN connection / for a maximum data rate of 20 Mbit/s per link.
  - 1 buffered RS 422 RESET-IN connection.
  - 1 buffered RS 422 RESET-OUT connection.

  (The layout of these connectors follows the standard of the transputer modules of the German transputer module manufacturer 'PARSYTEC'.)

- one 10-pin connector, named resp. EVT-X' and 'EVT-Y', containing:
  - 1 buffered RS 422 EVENT-OUT connection.
  - 1 buffered RS 422 EVENT-IN connection.

- one 14-pin connector, named resp. 'ARE-X' and 'ARE-Y', containing:
  - 1 buffered RS 422 ERROR-IN connection.
  - 1 buffered RS 422 ERROR-OUT connection.
  - 1 buffered RS 422 ANALYSE-IN connection.
  - 1 buffered RS 422 RESET-IN connection.

By setting the jumpers of jumper block DAISY-CHAIN the 14-pin connectors 'ARE-X and ARE-Y' can also be used to include both transputers into a 'analyse-reset-error' daisy chain (INMOS standard). The connectors are then revered to as 'DAISY_IN' and 'DAISY_OUT'.

| Connector 'DAISY_IN' then contains: | Connector 'DAISY_OUT' contains: |
|---|---|
| - 1 buffered RS 422 ERROR-OUT connection. | - 1 buffered RS 422 ERROR-IN connection. |
| - 1 buffered RS 422 ANALYSE-IN connection. | - 1 buffered RS 422 ANALYSE-OUT conn. |
| - 1 buffered RS 422 RESET-IN connection. | - 1 buffered RS 422 RESET-OUT conn. |

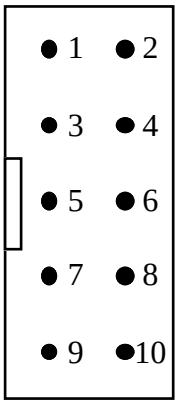
NOTE: See next page for the connector layouts.

## 2. POSITION OF THE 2TP-VME-LA MODULE-IN THE VME CRATE:

The LA-module must be placed at the back of the VME-J2 backplane of the VME crate, at the connector J2 opposite the 2TP-VME-module. The LA-module receives its power and ground from the power and ground pins of the middle row of connector J2 as defined by the VME specifications. If the J2 connector is of a type which does not have wire-wrap pins on the middle row at the back of the crate, then two power connection holes on the LA-print (one for power and one for ground) can be used to provide power to the module.
The LED "POSITION OK" indicates the right placement of the LA-module opposite the 2TP-VME-module!

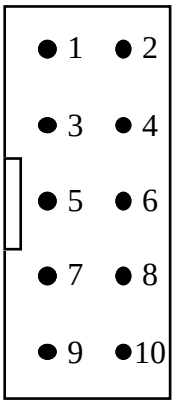
## 3. CONNECTOR LAYOUTS:

Connectors LINK-X0 to LINK-X3
and LINK-Y0 to LINK-Y3:



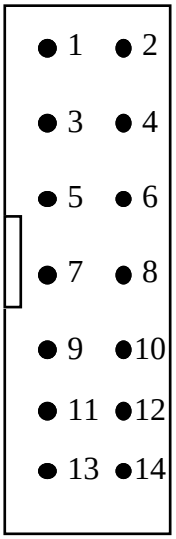

1. RESET IN +
2. RESET IN -
3. LINK IN +
4. LINK IN -
5. GND
6. GND
7. LINK OUT -
8. LINK OUT +
9. RESET OUT -
10. RESET OUT +

Connectors EVT-X and EVT-Y:



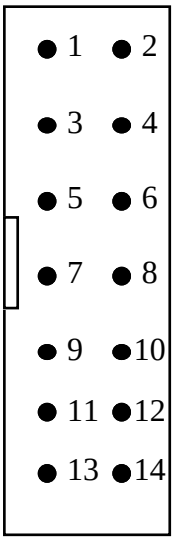

1. unconnected
2. unconnected
3. EVENT IN +
4. EVENT IN -
5. GND
6. GND
7. EVENT OUT -
8. EVENT OUT +
9. unconnected
10. unconnected

Connector ARE-X
(DAISY-IN):




1. ERROR IN X +
2. ERROR IN X -
3. RESET IN X +
4. RESET IN X -
5. ANALYSE IN X +
6. ANALYSE IN X -
7. GND
8. GND
9. unconnected
10. unconnected
11. unconnected
12. unconnected
13. ERROR OUT X -
14. ERROR OUT X +

Connector ARE-Y
(DAISY-OUT):

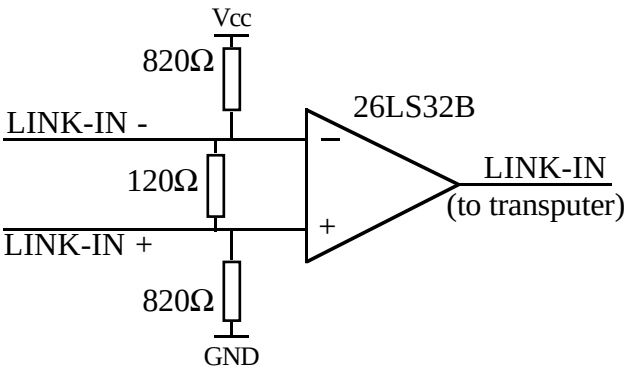


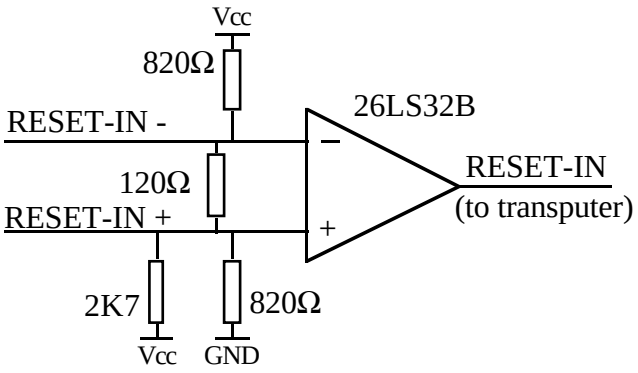

1. ERROR IN Y +
2. ERROR IN Y -
3. RESET IN Y +
4. RESET IN Y -
5. ANALYSE IN Y +
6. ANALYSE IN Y -
7. GND
8. GND
9. ANALYSE OUT -
10. ANALYSE OUT +
11. RESET OUT -
12. RESET OUT +
13. ERROR OUT Y -
14. ERROR OUT Y +

## 4. THE INPUT CHANNELS:

Each input channel is provided with a termination resistor network to keep the input channel quiet (= inactive) when unconnected.

The termination network of the LINK-IN channels have an input resistance (Ri) of 111 Ω and a threshold voltage (Vth) of 337 mV.
The termination network of all other input channels (RESET-IN, ANALYSE-IN, EVENT-IN, ERROR-IN) have a Ri = 110 Ω and a Vth = 290 mV. These input have an aditional resistor of 2K7 to Vcc so that they can also be driven by a single ended TLL signal (low active).

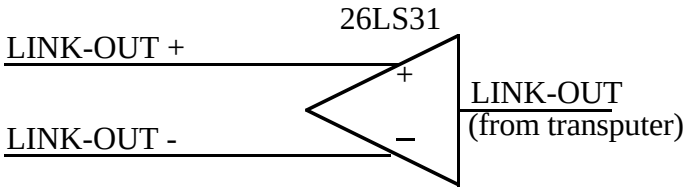



## 5. THE OUTPUT CHANNELS:

All outputs are balanced RS422 outputs for driving differential inputs.

The output voltages are: logic '0': dV = V(+) - V(-) = -3.5 V
logic '1': dV = V(+) - V(-) = +3.5 V



## 6. FUNCTION OF THE 'DAISY-CHAIN' OPTION ON THE 2TP-VME-LA MODULE:

The jumper block 'DAISY CHAIN' selects between:
- DAISY-CHAIN = OFF: an independent analyse-reset-error connecion with each transputer of the 2TP-VME Module. For an example with two 2TP-VME Modules, see figure 2:
  Each of the four transputers has its own connections to a "master module". Thus each transputer is capable of sending an error to the master, and is capable of receiving its 'own' reset and analyse command from this master without interfering in the functioning of the other transputers.

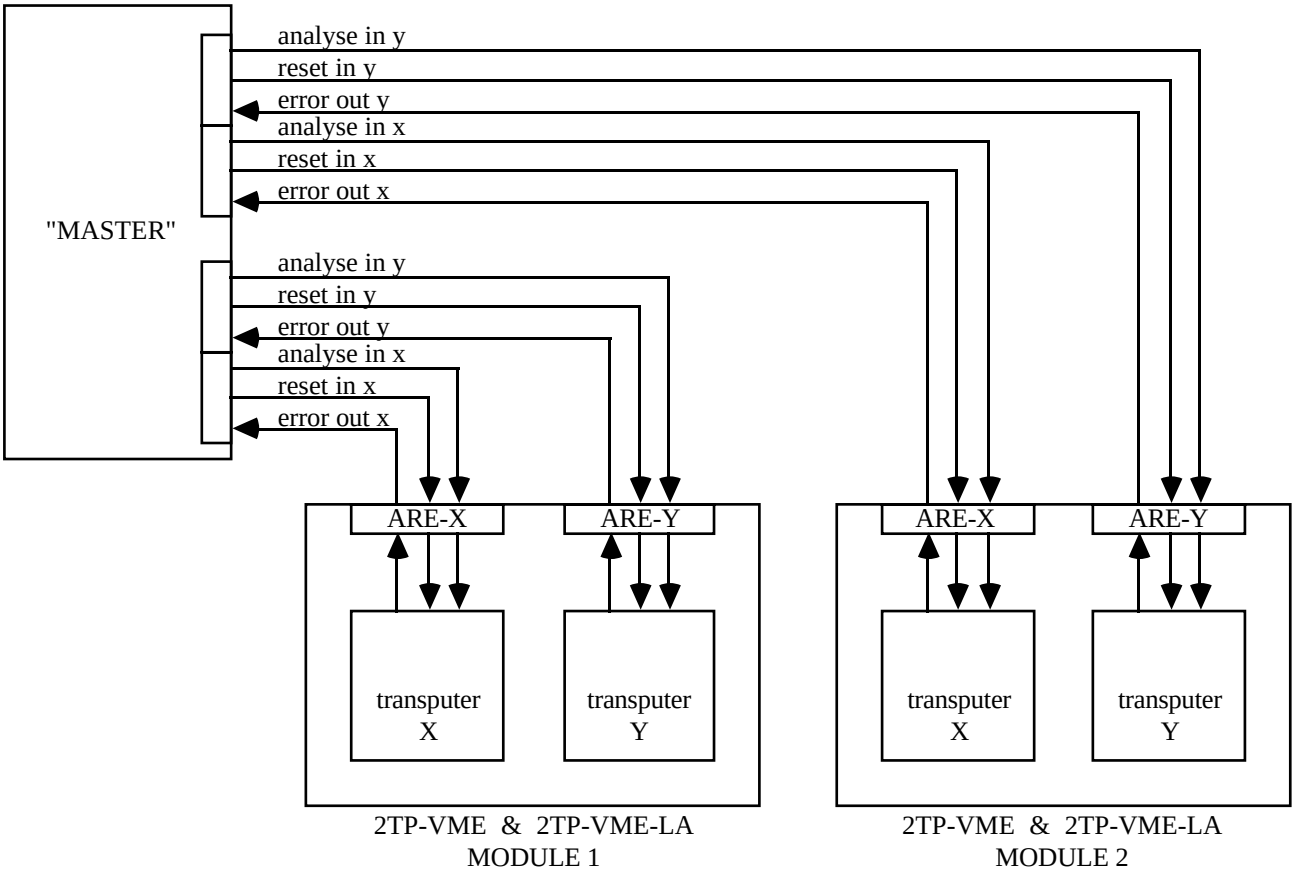



**Figure 2. An example configuration with jumper block DAISY CHAIN in position OFF.**

- DAISY-CHAIN = ON: a daisy-chained analyse-reset-error connection wherein the transputers of the 2TP-VME Module are placed in a daisy-chain together with other transputers. For an example with two 2TP-VME Modules, see figure 3: The error-in and error-out pins of all the transputers are daisy-chained. The error-out of the first transputer in the daisy-chain is coupled to the master. The analyse-in and reset-in of the first transputer in the daisy-chain is coupled to the master. From there the analyse and reset commands are "bussed" to all the other transputers.

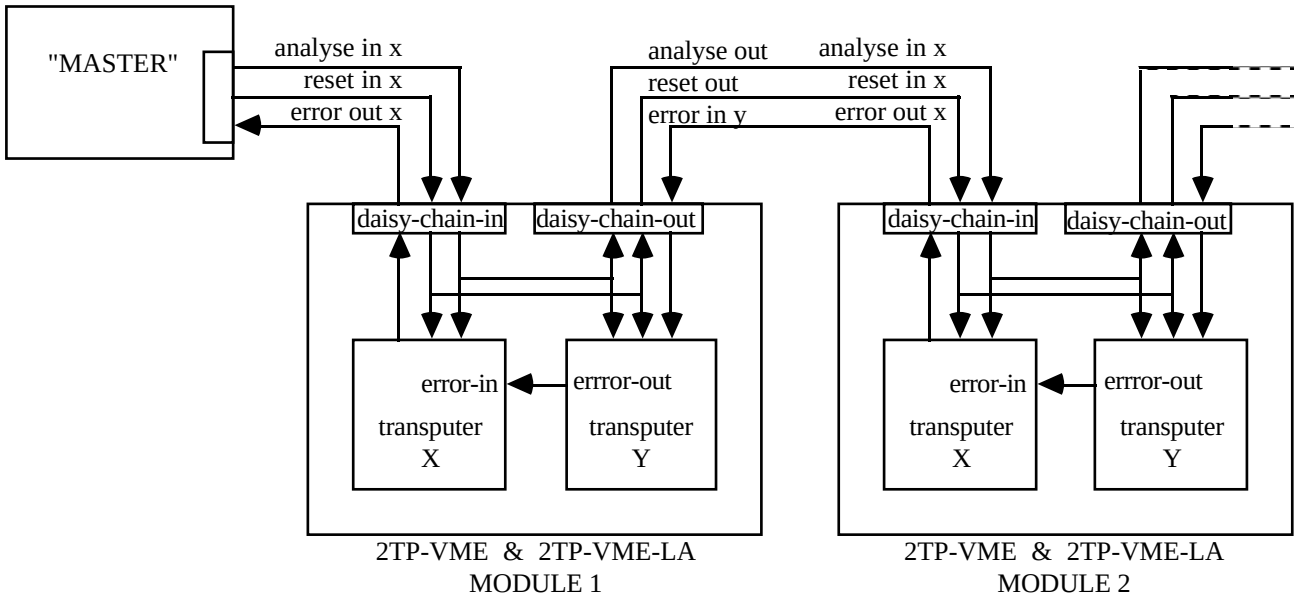



**Figure 3. An example configuration with jumper block DAISY CHAIN in position ON.**

## 7. ANALYSE-IN AND ANALYSE-OUT SIGNALS ON THE 2TP-VME-LA MODULE

ANALYSE-IN signals:

The ANALYSE-IN input of transputer X on the 2TP-VME module is activated when:
- the ANALYSE-IN-X channel received via the ARE-X connector is activated.

The ANALYSE-IN input of transputer Y on the 2TP-VME module is activated when:
- the ANALYSE-IN-Y channel received via the ARE-Y connector is activated,
- or, only in 'DAISY CHAIN' mode, when the ANALYSE-IN-X channel via the ARE-X connector is activated.

ANALYSE-OUT signals:

The ANALYSE-OUT channel on the ARE-Y connector is activated if, only in 'DAISY CHAIN' mode, the ANALYSE-IN-X channel via the connector ARE-X is activated.

## 8. RESET-IN AND RESET-OUT SIGNALS ON THE 2TP-VME-LA MODULE

RESET-IN signals:

The RESET-IN input of transputer X on the 2TP-VME module is activated when:
- one of the RESET-IN channels received via the LINKX0-X3 connectors is activated,
- or the RESET-IN-X channel received via the ARE-X connector is activated.

The RESET-IN input of transputer Y on the 2TP-VME module is activated when:
- one of the RESET-IN channels received via the LINKY0-Y3 connectors is activated,
- or the RESET-IN-Y channel received via the ARE-Y connector is activated,
- or, only in 'DAISY CHAIN' mode, when the RESET-IN-X channel via the ARE-X connector is activated.

RESET-OUT signals:

Transputer X on the 2TP-VME module is capable of activating, under software control, the RESET-OUT channel on the connectors LINKX0-X3.

Transputer Y on the 2TP-VME module is capable of activating, under software control, the RESET-OUT channel on the connectors LINKY0-Y3.

The RESET-OUT channel on the ARE-Y connector is activated if, only in 'DAISY CHAIN' mode, the RESET-IN-X channel via the connector ARE-X is activated.

## 9. ERROR-IN AND ERROR-OUT SIGNALS ON THE 2TP-VME-LA MODULE

ERROR-IN signals:

The ERROR-IN input of transputer X on the 2TP-VME module is activated when:
- the ERROR-IN-X channel received via the ARE-X connector is activated, but ONLY if the 'DAISY CHAIN' mode is NOT selected.
- the ERROR-OUT output of transputer Y is activated, but ONLY if the 'DAISY CHAIN' mode IS selected.

The ERROR-IN input of transputer Y on the 2TP-VME module is activated when:
- the ERROR-IN-Y channel received via the ARE-Y connector is activated

ERROR-OUT signals:

The ERROR-OUT-X channel on the ARE-X connector is activated when:
- the ERROR-OUT signal of transputer X is activated.

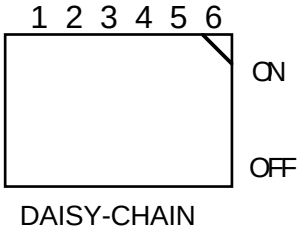
The ERROR-OUT-Y channel on the ARE-Y connector is activated when:
- the ERROR-OUT signal of transputer Y is activated, but ONLY if the 'DAISY CHAIN' mode is NOT selected.
  If the 'DAISY CHAIN' mode is selected, then ERROR-OUT-Y channel on connector ARE-Y is always inactive. (The ERROR-OUT signal of transputer Y is connected via the daisy chain jumpers with the ERROR-IN siganl of transputer X.)

## 10 POSITION OF THE 'DAISY CHAIN' JUMPERS ON THE 2TP-VME-LA MODULE

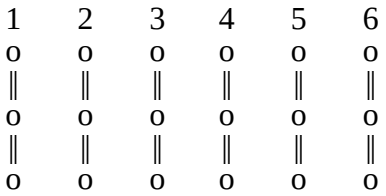
## 11. SETTINGS OF THE 'DAISY-CHAIN' JUMPERS AT THE 2TP-VME-LA MODULE:

POSITION OF THE JUMPER BLOCK 'DAISY-CHAIN' ON THE LKBUF MODULE:
See figure 1 showing the component layout of the 2TP-VME-LA module.

LAYOUT SYMBOL:

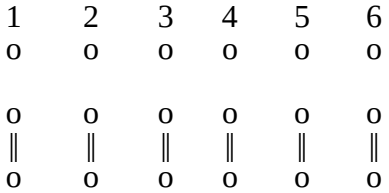



SCHEME OF JUMPER BLOCK 'DAISY-CHAIN':

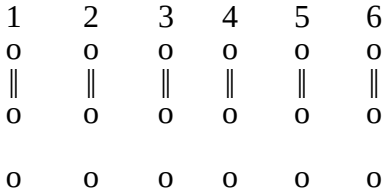



FOR SELECTION:

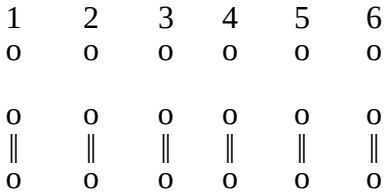
A) Daisy-chain OFF:




B) Daisy-chain ON:




DEFAULT SETTING:
option a, daisy chain off



## 12. LAYOUT OF CABLES TO BE USED WITH THE 2TP-VME-LA MODULE.

For connections between 2TP-VME-LA modules 10-wire twisted flatcables and 14-wire twisted flatcables can be used, if the maximum length is less than app. 20 meters. The layout of these cables must be:

| 10-pin 3M connector 1 | | 10-pin 3M connector 2 |
|---|---|---|
| • pin 1 | <-----> | pin 10 |
| pin 2 | <-----> | pin 9 |
| pin 3 | <-----> | pin 8 |
| pin 4 | <-----> | pin 7 |
| pin 5 | <-----> | pin 6 |
| pin 6 | <-----> | pin 5 |
| pin 7 | <-----> | pin 4 |
| pin 8 | <-----> | pin 3 |
| pin 9 | <-----> | pin 2 |
| pin 10 | <-----> | • pin 1 |

| 14-pin 3M connector 1 | | 14 pin 3M connector 2 |
|---|---|---|
| • pin 1 | <-----> | pin 14 |
| pin 2 | <-----> | pin 13 |
| pin 3 | <-----> | pin 12 |
| pin 4 | <-----> | pin 11 |
| pin 5 | <-----> | pin 10 |
| pin 6 | <-----> | pin 9 |
| pin 7 | <-----> | pin 8 |
| pin 8 | <-----> | pin 7 |
| pin 9 | <-----> | pin 6 |
| pin 10 | <-----> | pin 5 |
| pin 11 | <-----> | pin 4 |
| pin 12 | <-----> | pin 3 |
| pin 13 | <-----> | pin 2 |
| pin 14 | <-----> | • pin 1 |

## 13. INTERCONNECTIONS BETWEEN TRANSPUTER X AND TRANSPUTER Y.

### 13.1. CONNECTING A LINK OF TRANSPUTER X TO A LINK OF TRANSPUTER Y:

A connection between for example transputer X link 1 and transputer Y link 2 is made by plugging in your short 10-wire cable in headers LINK-X1 and LINK-Y2.
Notice that at both sides of the cable the triangle symbol (which denote 'pin 1' at the cable connector and the header) is at a diffrent side of the cable!

### 13.2. CONNECTING THE EVENT CHANNEL OF TRANSPUTER X TO TRANSPUTER Y *):

Plugging in a 10-wire cable in headers EVENT-X and EVENT-Y enables transputer X and transputer Y to send and receive Events to each other.
Notice that at both sides of the cable the triangle symbol (which denote 'pin 1' at the cable connector and the header) is at a diffrent side of the cable!
*) Transputer X and transputer Y already have an onboard event connection. So this offboard event connection is for test purposes only.

### 13.3. CONNECTING THE ERROR CHANNEL OF TRANSPUTER X TO TRANSPUTER Y:

Plugging in a 14-wire cable in header ARE-X for transputer X and ARE-Y for transputer Y enables to send Errors to each other.
Notice that at both sides of the cable the triangle symbol (which denote 'pin 1' at the cable connector and the header) is at a diffrent side of the cable!

## 14. CONNECTING THE 2TP-VME-LA MODULE AND THE CAPLIN-2T MODULE.

The 2TP-VME transputers use the PARSYTEC link standard:
- LINK-IN: RS422 balanced input, Ri = 111Ω, received by a 26LS32B
- LINK-OUT: RS422 balanced output, driven by a 26LS31
- RESET-IN: RS422 balanced input, Ri = 110Ω, received by a 26LS32B
- ANALYSE-IN: RS422 balanced input, Ri = 110Ω, received by a 26LS32B
- ERROR-OUT: RS422 balanced output, driven by a 26LS31

The RESET-IN and ANALYSE-IN inputs can also be driven by a single ended, low active TLL signal.

The CAPLIN_2T transputers use the INMOS link standard:
- LINK-IN: TTL compatible input, 10K resistor to GND, clamp-diode to Vcc
- LINK-OUT: TTL compatible output, 100Ω output series resistor, driven by a 74ACT244
- RESET-OUT: TTL compatible output, active low, driven by a 74LS240
- ANALYSE-OUT: TTL compatible output, active low, driven by a 74LS240
- ERROR-IN: TTL compatible input, active low, received by a 74LS373

The CAPLIN development software uses only the link and reset lines, i.e. a connection of analyse and error is not mandatory.

### 14.1 AN UNBALANCED CONNECTION BETWEEN THE 2TP-VME-LA MODULE AND THE CAPLIN BOARD:

Advantages:
- easy to connect: you only need to make an adaptor cable and place a simple resistor network at the LINK-IN(-) input of the used link channel. (This resistor network can be soldered at the back of the 2TP-VME-LA print directly between the connector pins and a nearby Vcc point. NOTE: Don't forget to remove the resistor network when you plan to drive the LINK-IN channel with a balanced signal!)

Disadvantages:
- maximal link speed is 10 Mbit/s,
- not recommended for longer distances.

Make the connection between the 2TP-VME-LA module and the CAPLIN_2T board as shown in figure 4.

CHECK:
- The speed of the used transputer links of both modules must be set to 10 Mbit/s/s. (See short hardware description of the 2TP-VME module).

## 14.2. A BALANCED CONNECTION BETWEEN THE 2TP-VME-LA MODULE AND THE CAPLIN BOARD:

Advantages:
- maximal link speed 20 Mbit/s
- safe communication along twisted-pair cables up to 50 meters

Disadvantages:
- you need to build a (simple) interface, which is placed at the CAPLIN-side of the cable to translate the RS422 signals into TTL signals and vice versa. Figure 5 shows the hardware of this interface.

Make the connection between the 2TP-VME-LA module and the CAPLIN-2T board as shown in figure 5.

CHECK:
- The speed of the used transputer links of both modules must be set to 20 Mbit/s/s. (See short hardware description of the 2TP-VME module).