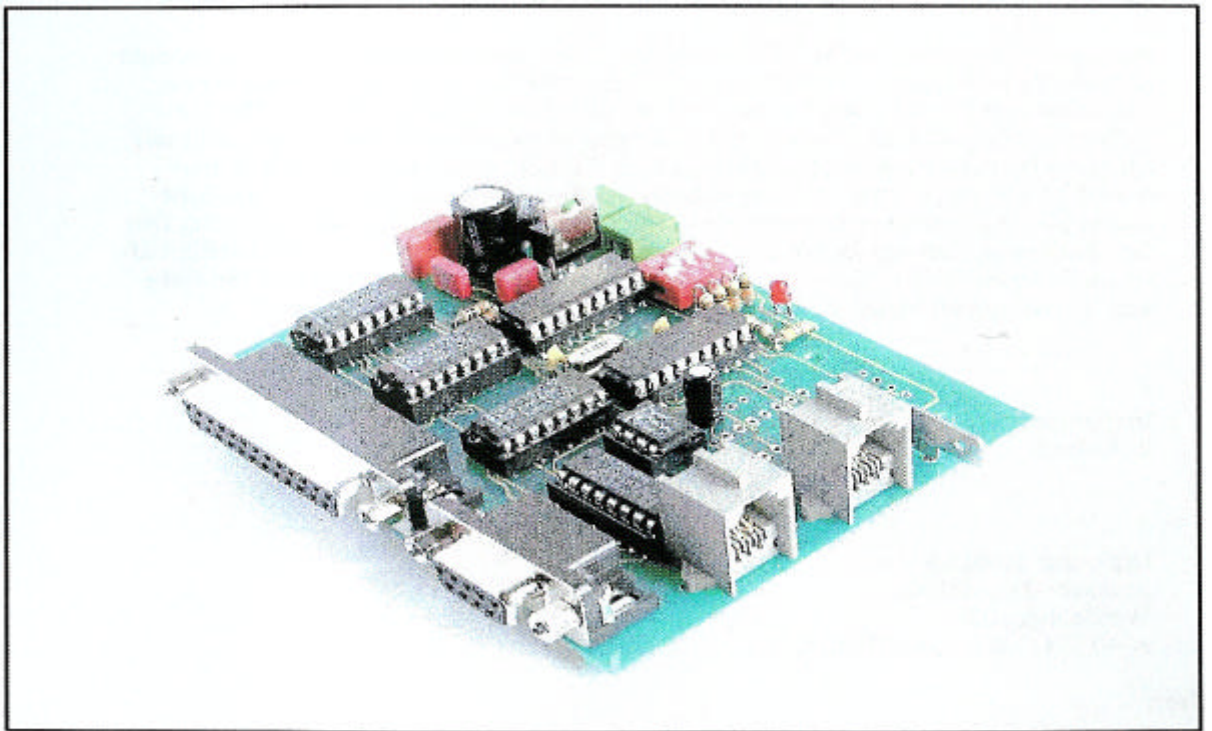


Instruction manual to

CAN-Interface Module

CSA-32



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The use of the software contained or supplied with this product (either stored or programmed in CPU's) is only allowed in conjunction with the product itself.

Note

This manual as well as the hardware module CSA-32 was produced with great care. Should you have any comments, corrections or suggestions to the manual or the module please forward them to the address below. Basic knowledge about electronic components and soldering skills are a prerequisite before attempting the assembly of this module. If needed, consult appropriate literature about this subject first.
When operating this unit, please follow the relevant safety rules. No guarantee or restitution for damage or subsequent damage caused by this product will be made. Any warranty will be void if this manual isn't strictly followed.
We can't guarantee that this module works with every hardware and software combination due to the number of possibilities. After inspecting this product, you as end user or licensee respectively, will accept it "as is".

Revisions

- | | |
|------------|------------------|
| 1. Edition | V1.0, March 2003 |
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1. General Notes

1.1 Safety notes

Follow the safety guidelines and regulations applicable in your area when working with electrical appliances

Please keep this instruction manual in a safe place for future reference.

- Before you operate this module make sure it is intended for that purpose.
- Install this module in an appropriate housing before operating it to prevent electrical shock .
- Examine all attached wiring for breaks or insulation failure. Repair such defects immediately.
- Before opening electrical equipment or working on them using appropriate tools, ensure that the power cord is pulled first and any stored energy is discharged.
- When installing electronic components, choose them according to the specifications given in the manual supplied with the equipment.
- Contact a professional or the manufacturer if any explanation in this manual is unclear.
- Any error in assembling or operating this unit is your responsibility and no restitution of any damage will be made.
- All semi conductors, especially IC's, are susceptible to static discharge. Make sure your body is not electrically charged, by touching a metal body first such as a copper water pipe. Wearing a ground strap or working on a ground mat is highly recommended.

1.2 Description

The CSA-32 module is a digital input/output device containing a CAN bus interface. It is designed for the control of model railroads with a ZIMO DCC system using their CAN bus parameters (125Kbit/sec transfer rate).

Up to 64 bulbs or LED's can be operated by one PLV-32; the PTP-64 board manages up to 64 push buttons.

The module can be configured via CAN bus to act either as an input or output device with a bias voltage of +5V or 0V.

The number of in/outputs can be raised to 192 by using the PLV-32 and/or PTP-64 boards; also available from us. The CSA-32 module contains the logic for communication and control of these boards.

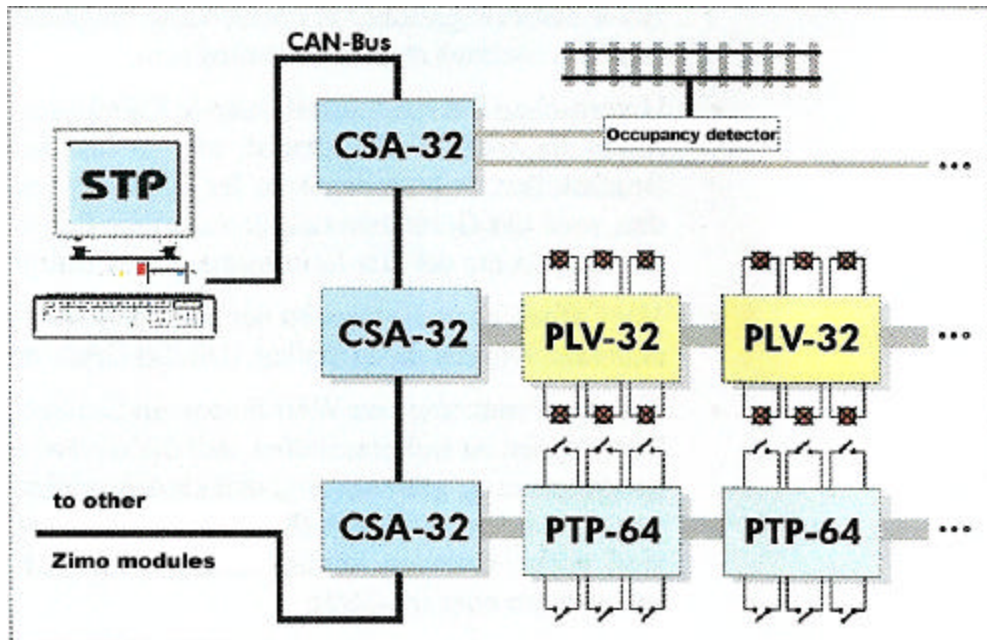


Fig. 1. In/Outputs of CV-32 module

A DIP switch is provided to assign an address between 1 and 15 to the module. A maximum of 15 CSA-32 modules are allowed on one CAN bus. Power is supplied from either an external source (8-24V DC or AC) or direct from the ZIMO CAN bus connector. The power required for other modules, like the PLV-32 or PTP-64, can in both cases be supplied by the CSA-32 module.

The module is controlled by a PIC16F627 micro controller, is included in this kit and already programmed. An LED indicates whether the module is in the programming or operations mode and whether it is sending or receiving data.

1.3 Applications

The main purpose of the CSA-32 module is the control of light bulbs or LED's and as an input device for push buttons, as is commonly used in model railroading for signals and switch boards. Even though bulbs and LED's can be connected directly to a CSA-32 module, one or several PLV-32 or PTP-64 boards are usually used to increase the numbers of connections and thereby bringing the cost down. Each CSA-32 module accepts up to six PLV-32 or three PTP-64 boards but not mixed at the same CSA-32 module! A total of 192 bulbs/LED's or 192 push buttons may be connected to each CSA-32 module.

Furthermore, occupancy detectors may be connected provided the detectors can indicate an occupied state permanently, using a +5V input signal (not momentary switches). 24 detectors may be connected to each CSA-32 module. A separate ground circuit is required between the detectors and the CSA-32 module.

Please note that STP doesn't support the direct connection of push buttons and bulbs to a CSA-32 module, without the use of PLV-32 or PTP-64 boards.

The STP software which beginning with version 4.3 supports the CSA-32 modules for the above applications, controls the modules. Further information regarding the configuration of the STP software in conjunction with CSA-32 modules can be found in the STP manual (page 4-30).

When powering a module up for the first time, a flashing LED indicates that it is not configured for a specific task yet. That is, whether the module's task is to check for occupancy, control lights or accept push button inputs. The configuration is done in STP via CAN-bus and is confirmed a success when the LED stops flashing and remains lit. The configuration is permanently stored and the LED is on steady when the unit is powered up the next time. Even so, the configuration may be changed at any time.

Please note that the control of this module by Zimo components only (MX1 and MX2 w/o PC) is not possible at this time. The application of this module in other areas is conceivable but strictly at the users own risk! The CAN-bus protocol is available at the request from the manufacturer.

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2. Module Assembly

2.1 Parts List

Qty	Code	Description	Value	Conrad #	Reichelt #
1	BR1	Bridge rectifier	B80C1500	501441	B80C1500Rund
1	C1	Electrolytic condenser	470uF, 35V	472530	RAD 470/35
1	C2	Styroflex condenser	0.47uF, 100V	458112	MKS-4 470n
2	C3, 4	Ceramic condenser	18pF	457159	KERKO 18p
1	C5	Styroflex condenser	0.01uF, 63V	455334	MKS-2 10n
1	D1	LED 3mm, red	LED	184560	LED 3mm ST-rt
1	D2	Diode	IN4001	162213	IN 4001
1	IC1	Voltage regulator	7805	179205	uA7805
1	IC2	CPU	PIC16F627-04	1)	1)
1	IC3	CAN-bus driver	MCP2510-I/P	165113	2)
4	IC4-7	I2C I/O interface	PCF8574AP	2)	PCF8574P
1	IC8	CAN bus driver	82C250	2)	PCA 82C250
1	J1	2-pin socket	K1X2	732416	STIFTL. 36G
1	K1, 8	2-pin socket, 3.5mm pin configuration + suitable connectors	PTRX2	729892 + 729833	AKL 182-02 + AKL 169-02
1	K3	SUB-D 25-pin socket	D-SUB25	741361	D_SUB BU 25 US
1	K4	SUB-D 9-pin socket	D-SUB9	741345	D_SUB BU 09 US
2	K6, 7	RJ12 socket, 6-pin	WESTERN-6P	2)	MEBP 6-6
1	K9	Spade terminal	1X01	732745	FS-PW-6.35
1	Q1	Oscillator	4MHz	182087	4-HC49U-S

Qty	Code	Description	Value	Conrad #	Reichelt #
5	R1-5	Resistor	10kO, ¼ W	403377	¼ W 10K
1	R6	Resistor	470O, ¼ W	403210	¼ W 470
2	R7, 8	Resistor	10kO, ¼ W	403377	¼ W 10K
1	S1	Quad DIP-switch	SCHIEB4	704776	NT04
2	--	18-pin IC socket	IC SOCK18	189537	GS18
4	--	16-pin IC socket	IC SOCK16	189529	GS16
1	--	8-pin IC socket	IC SOCK8	189502	GS8
1	C6	Electrolytic condenser	10uF, 63V	3)	3)
1	C7	Electrolytic condenser	10uF, 63V	3)	3)
1	C11	Styroflex condenser	100nF, 63V	3)	3)
3	C8-10	Electrolytic condenser	10uF, 63V	3)	3)
1	IC9	Interface IC	MAX232CP	3)	3)
1	K5	9-pin socket	D-SUB9	3)	3)

- 1) Is included with this kit
- 2) This part was not available from this supplier at time of printing
- 3) This part is not needed for the module as described in this manual (Spring 2003)

Addresses for above mentioned suppliers:

Conrad Electronic
Klaus-Conrad-Strasse 1
D-92240 Hirschau
Tel. 09622/30-0
Fax: 09622/408848
www.conrad.de

Reichelt Elektronik e.Kfr
Elektronikring 1
D-26452 Sande
Tel. 04422/955-333
Fax: 04422/955-111
www.reichelt.de

Conrad Electronic and Reichelt Elektronik are well known electronic parts suppliers in Europe. They can be found on the Internet. Parts are also available from other suppliers and are frequently sold with the same part numbers or can be crossed over to the numbers used by them.

2.2 General Assembly Hints

Before beginning with the assembly of this module, it is recommended to have the following tools ready:

- A heat resistant work base
- A small side cutter
- A small wire stripper
- Tweezers to handle small parts
- A soldering iron with a small tip
- A soldering iron holder and a sponge
- Solder, 0.5mm diameter
- Wire with a minimum of 0.25mm diameter

The following are a few tips for the proper use of a soldering iron. Feel free to skip this section if your soldering skills are sufficient:

- Use a small soldering iron, maximum 30Watt. To ensure a speedy heat transfer to components, the soldering tip should be kept clean. Wipe the tip on a moist sponge every time before starting to solder.
- Use exclusively solder designed for electronic work, such as: SN60PB (60% tin, 40% lead) containing flux.
- Don't use any other solder paste or liquid to solder electronic components. They may contain acid, which will destroy components and copper traces on circuit board.
- Components can also be destroyed if the solder process takes too long. Other components may be de-soldered and copper traces lifted off the circuit board if excess heat is applied.
The solder time should be limited to 5 seconds especially when dealing with semi conductors, LED's, electrolytic condensers and IC's, to prevent above problems.
- Hold the solder tip to the work so that both parts to be joined are touched. Add a little solder. Remove the solder wire as soon as it starts to flow. Hold the soldering iron for a few more seconds to allow the solder to flow evenly around the components legs and then remove the iron.
- Don't move the soldered components for about 5 seconds. A clean, shiny solder joint should be the result.
- Cut the components legs just above the solder joint using a small side cutter. Excess solder can be liquefied again, by applying heat with a clean solder tip. The solder will flow back to the tip of the soldering iron.

2.3 Module Assembly

Locate all the components on the layout diagram before starting. Arrange the components according to their type. The different component types have different peculiarities that need to be considered during installation.

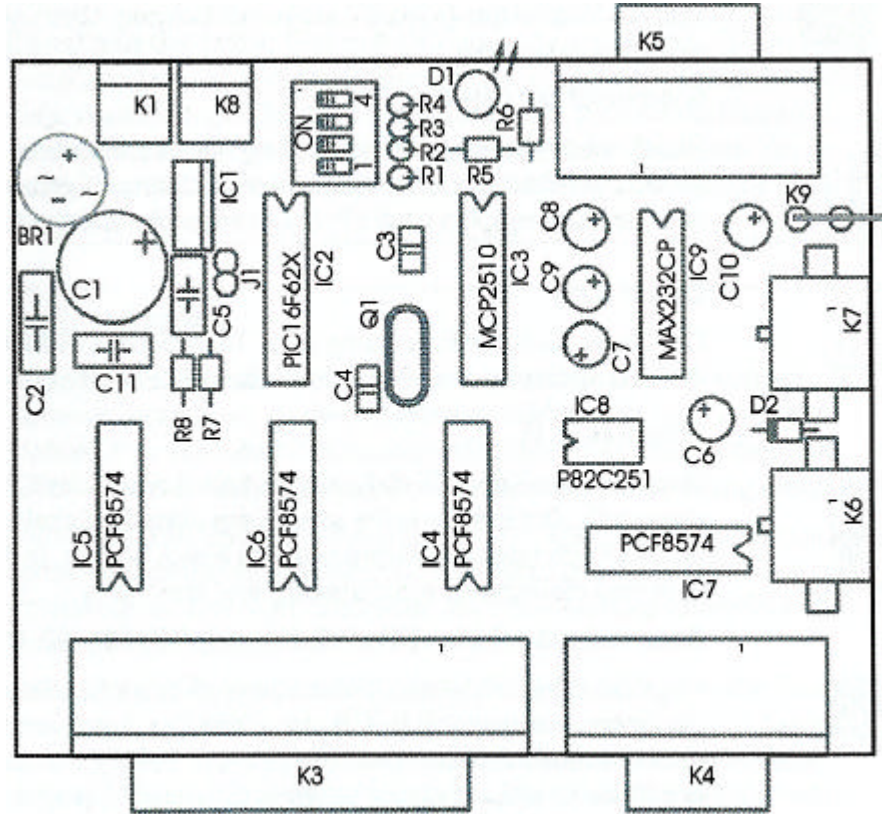


Fig. 2. Layout diagram

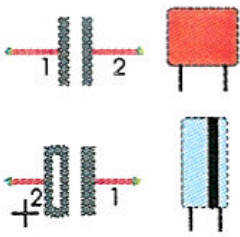
Resistors (R1 - R8)

Resistors limit current flow. The resistor's value is indicated with color bands. Here a couple of examples:



Value	Color Band
470ohm	Yellow-pink-brown (gold)
10kohm	Brown-black-orange (gold)

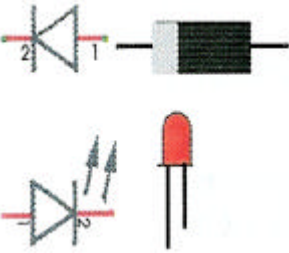
The color shown in brackets is the allowed tolerance (5 or 10%). A resistor can be installed in either direction.



Condensers (C1 - C5)

There are different kinds, the ordinary (ceramic, styroflex) and the electrolytic condenser. The latter are polarity sensitive and can only be installed in a specific direction. The negative side is marked with a line and is also indicated in the schematic.

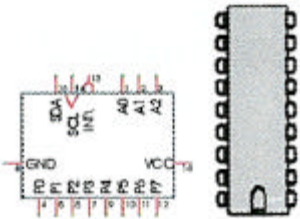
Diodes / LED's (D1, D2)



Diodes are like one-way valves and are to be installed in a specific direction also. One end of the diode is marked with a line which represents the direction (exit side) current is allowed to travel. This line is also shown in the diagram.

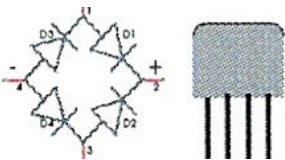
LED's have two connecting legs of different lengths for polarity indication. The longer leg is the anode, which is shown in the diagram with two arrows pointing up.

IC's (IC1 - IC7)



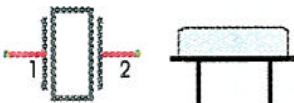
The notch on an IC indicates the installation position. Again, this marking is also shown in the schematic. Sockets are soldered to boards to facilitate the easy exchange of an IC. The voltage regulator (IC1) is to be installed with the heat sink (metal bracket) pointing to the right, in direction of IC2.

Rectifier (BR1)



Rectifiers are used to convert AC power to DC. Check the schematic for the proper installation position.

Oscillator (Q1)



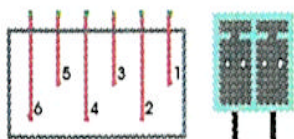
The crystal generates a frequency of 4 MHz for the operation of the CAN bus IC's. No specific installation position.

Switch (S1)



A quad-DIP switch is used to set the address of the CSA-32 module. It should be installed so that the 4th rocker is closest to the board's edge. The switches are closed (on) in the initial position.

Sockets (K1, K3, K4, K6, K7, K8, K9, J1)



The CSA-32 has a number of sockets at its disposal for power supply (K1, K8), CAN-bus (K6, K7) and in/outputs (K3, K4). They all make a secure and solder free connection possible. Depending on the CAN-bus socket type (there are unfortunately several different styles on the market), the nose on the backside of the bottom CAN-bus socket (K6) may need to be cut off with a side cutter. Otherwise there may not be enough room for the IC7. It may also be necessary to cut the two locator pins of both CAN-bus sockets if their position differs from the holes in the board.

The spade terminal (K9) is for the additional ground connection to the MX1 and should be used when occupancy detectors are employed (the holes may need to be enlarged a little). The CPU (central processing unit) may be reset by briefly connecting the two pins of connector J1 together.

Important Note: The components C6, C7, C8, C9, C10, C11, IC9 and K5 are not used with this version of the CSA-32 module and are not to be installed.

Assembly

The assembly in general starts with the smallest and ends with the tallest component. Therefore start the assembly with the diode and the level mounted resistors (R5-R8). The diode is also installed level with the board. Note the polarity marking on the diode.

The installation of the sockets may need some extra help when pushing home the plastic pins of K6 and K7. There are unfortunately two different styles of sockets. You may have to cut those plastic pins off.

Solder the components from the other side of the board and cut-off the remaining legs as short as possible with a side cutter. After that, solder in the IC socket, rectifier and oscillator, followed by the vertically mounted resistors (R1-R4).

Continue with the condensers (smaller ones first, note polarity with electrolytic's) and the switch. At last, solder the voltage regulator (IC1, heat sink toward IC2), LED D1 (note polarity, long leg towards R6!) and the sockets in place. Socket K8 (next to K1) should only be mounted if you actually plan to supply power to other modules, in order to prevent a mix-up and subsequently connecting the power lead to the wrong socket.

Now you are ready to insert the IC's. Note the polarity markings and make sure you are not statically charged when doing this. Also, be very gentle so as not to bend any of the many IC legs.

Please note: Electrolytic condensers, diodes, rectifiers and IC's have to be installed according to their polarity! If they are installed with reversed polarity, they could be damaged when powered up. In the worst case the whole module may be damaged.

2.4 Inspection

Don't power-up the module just now. There is a chance of injury due to faulty or incorrectly installed parts.

Remove the sharp edges that may have been left behind after cutting off the components legs. Excess solder, pieces of wires or legs may still be stuck on the board. Check both sides of the board and remove such debris.

Ensure that all components are installed and that the polarity is correct. Also make sure there are no bridges between component legs and copper traces caused by excess use of solder. If there are, remove them as they could destroy components. If everything checks out OK, continue with chapter 3.

3. Operation

3.1 Module addresses

Before a module can be operated it has to have its own unique address (1 - 15). This is what the DIP-switch is for (see Fig.2 on page 11).

The DIP switch has to be installed on the board so that switch #1 is on the IC2 side and switch #4 on the boards edge

The switch settings for the different addresses are shown in the table below. Note that switch address 0 is reserved and can not be used as a module address.

Address	DIP Switch 2)	Address	DIP Switch 2)
0 1)	on-on-on-on	8	on-on-on-off
1	off-on-on-on	9	off-on-on-off
2	on-off-on-on	10	on-off-on-off
3	off-off-on-on	11	off-off-on-off
4	on-on-off-on	12	on-on-off-off
5	off-on-off-on	13	off-on-off-off

Address	DIP Switch ²⁾	Address	DIP Switch ²⁾
6	on-off-off-on	14	on-off-off-off
7	off-off-off-on	15	off-off-off-off

- 1) Address 0 may not be used.
- 2) The DIP switch sequence is from left to right S1-S2-S3-S4.

Address 7 for instance is set like this:



Note: Address changes will only be read during power-up or during reset. Moving switches while the module is powered up will not change the address.

3.2 Wiring schematic and module hook-up

The module requires 8 - 24V DC or AC to function properly. Power can be supplied by either the socket K1 or one of the CAN-bus sockets (K6, K7).

The CAN-bus cable also provides suitable power for the module.

Important Note: Under no circumstances is it allowed to use both, K1 **and** K6/K7, for power supply simultaneously; also socket K8 may not be used for power input!

It is recommended to refrain from using the CAN-bus connector at the initial hook-up and supply power to K1 exclusively.

Socket K8 may be used to supply rectified power to other modules. This is still unregulated power though, that is, it is taken before the 5V regulator (IC1) of the CSA-32 module. Because the voltage is relatively high (@ 40V), it is limited as power supply for other modules and adequate cooling of the voltage regulators is required!

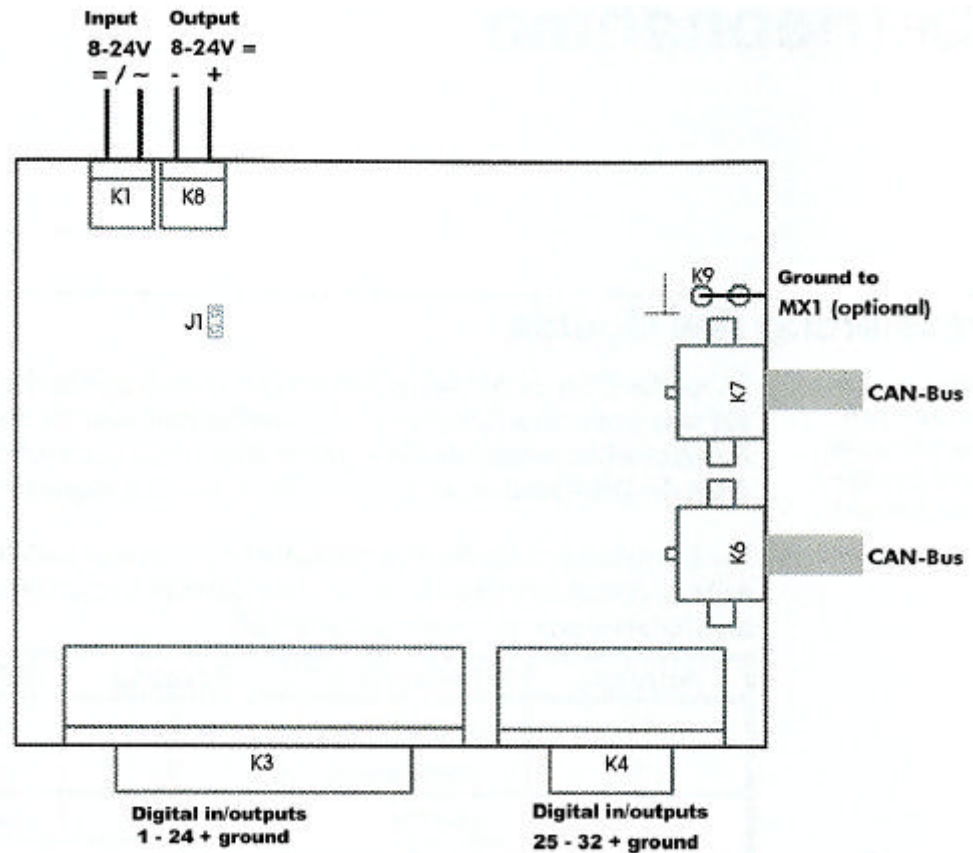


Fig. 3: CSA-32 connections

As already mentioned, the CAN-bus is connected to sockets K6 and/or K7. It doesn't matter which socket is used since they are internally wired in parallel.

Details for wiring the CAN-bus can be found in the Zimo and STP manuals.

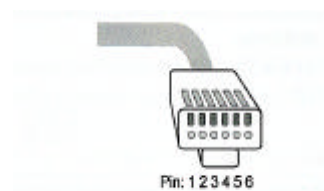


Fig. 4: Pin configuration for Zimo CAN-bus

To increase the reliability of data transmission and to take the load of the ground circuit in the CAN-bus cable, install a separate ground wire between the MX1 command station (connection marked as "Masse") and the K9 spade terminal.

Connecting the 2 pins of the jumper J1 causes the CSA-32 to reset to factory default values. This action is not needed under normal circumstances. A reset can also be carried out by disconnecting the power for at least 5 seconds.

3.3 Digital Inputs and Outputs

Occupancy detectors, PLV-32 and PTP-64 modules are connected to sockets K3 and K4. These sockets are chosen as SUB-D because wires and connectors are reasonable in price.

The CSA-32 module can be used in 5 different operating modes, which can be activated via CAN-bus, e.g. using a PC with STP software. The 5 modes are:

SUB-D connectors and sockets are used for the serial connection to the PC.

1. 32 digital input
2. 32 digital output (this mode is not supported by STP)
3. Controls up to six PLV-32 amplifier modules, for a total of 192 bulbs/LED's
4. Controls up to six PTP-64 amplifier modules, for a total of 192 push buttons
5. 32 digital input but inverted voltage levels (+5V = 0. 0V = 1)

The 32 in and outputs are assigned to two sockets as follows:

In/output 1 - 24: socket K3, pin #1 - 24

Ground: socket K3, pin #25

In/output 25 - 32: socket K4, pin #1 - 8

Ground: socket K4, pin #9

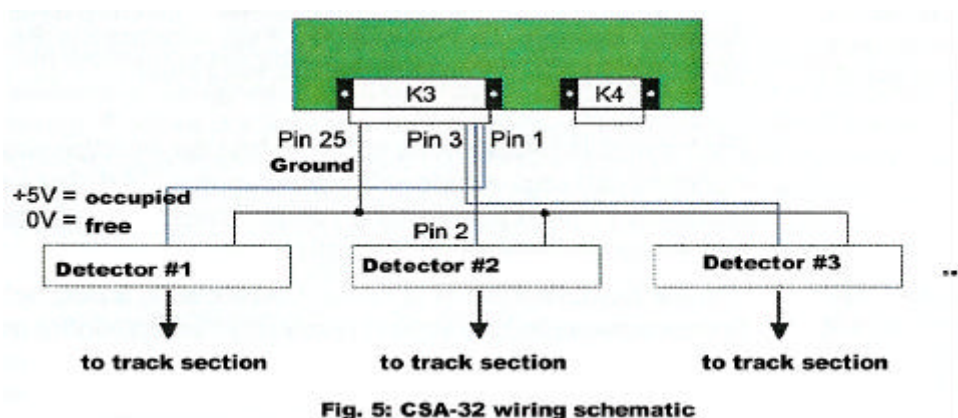
The pin numbers are printed on the sockets.

Mode 1 and 5 may be used for occupancy detectors which indicate occupancy according to the following logic:

Mode 1: +5V = occupied, 0V = unoccupied

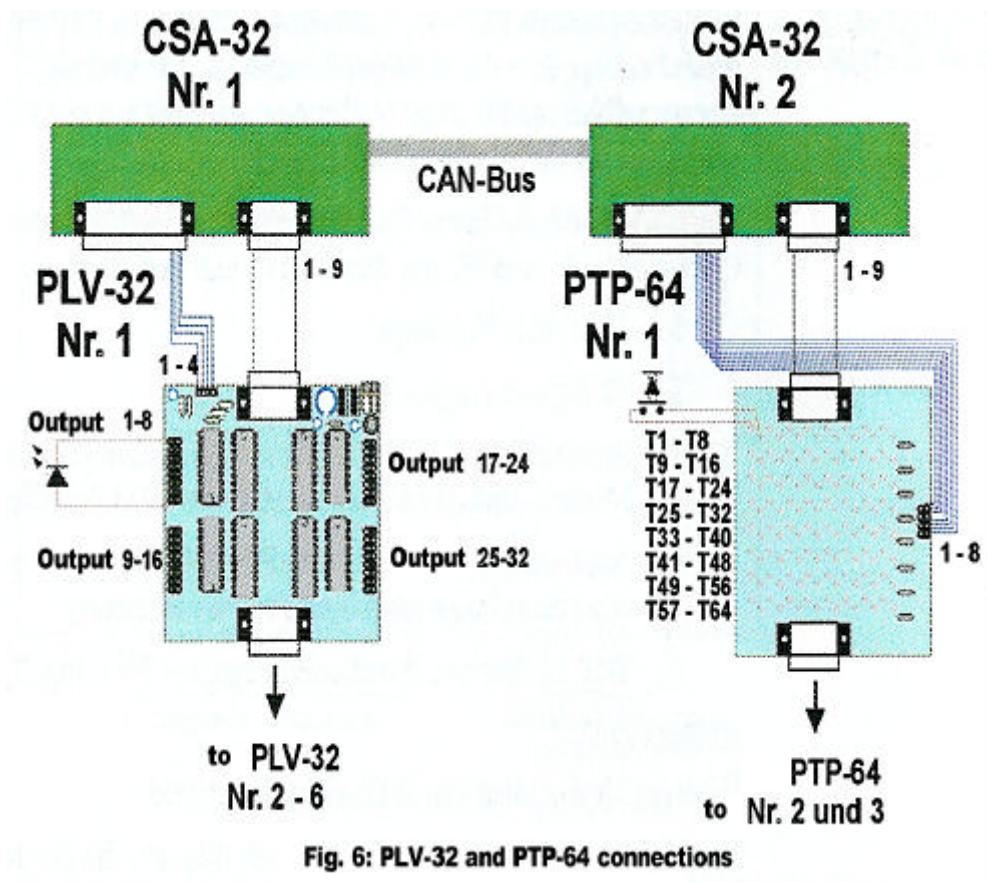
Mode 5: +5V = unoccupied, 0V = occupied

Please note that STP at the moment supports only 24 occupancy detectors per CSA-32 module, connected to pins #1-24 of socket K3. Pin #25 is ground and connected to each detector as well.



Mode 2 is for testing purposes with custom software and small power consuming items like LED's. Maximum output current is limited (see specifications on page 22).

Mode 3 and 4 increases the number of bulbs/LED's or push buttons if used together with booster modules PLV-32 or PTP-64. Please consult the appropriate manual regarding the wiring to the CSA-32 (these instructions are equally valid for the older PSA-32 module). Also note, that on a CSA-32 module either PLV-32 or PTP-64 modules may be connected but not both.



Important Note: The 64 diodes on the PTP-64 board have to be installed in opposite direction than is shown in the manual, if it is connected to a **PSA-32** module.

3.4 Power-up and testing with CANView

It is recommended, that with the initial power-up no leads are connected to the module other than the power leads to socket K1.

Set the DIP switch to address #1 (off-on-on-on). Turn power on. The LED (D1) must be flickering fast. If it doesn't, turn the power off immediately.

The module may be already set for an operating mode if the module's LED is lit rather than flashing. Program the module to address 0, turn the unit off and back on and set the new address.

The flashing diode indicates that the CPU started up correctly and is now waiting for a command on the CAN-bus as to which operating mode to engage (see section 3.3 in this manual).

To test the CAN-bus communication, turn the power off and connect the module with a CAN-bus cable directly to the CAN-bus interface at the computer. There should be no other modules connected to the CAN-bus for this test.

The picture below shows the pin-out of a PC CAN-bus connector. Connect only CAN-L and CAN-H with the CSA-32 module!

Power for this test has to be supplied by socket K1 only.

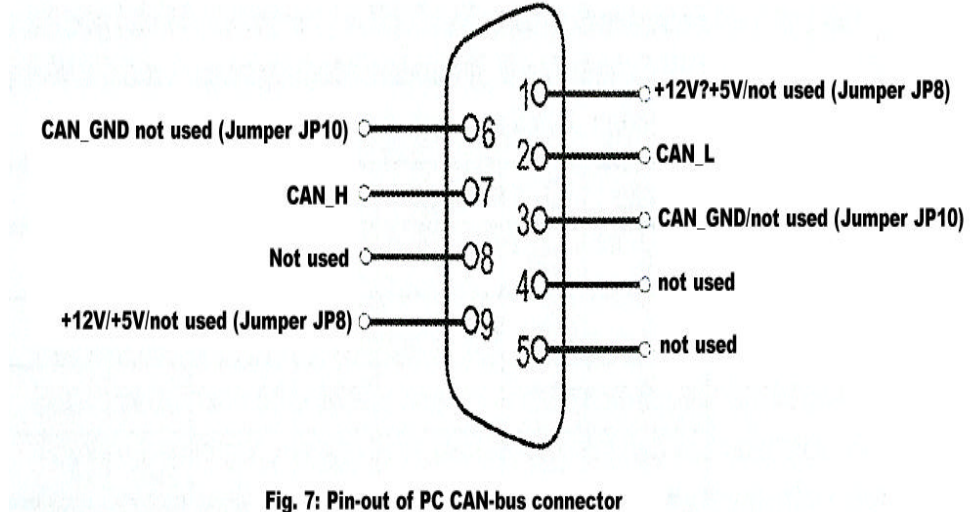


Fig. 7: Pin-out of PC CAN-bus connector

Start the PCANView program. You'll find the program on the STPV5 CD or on the floppy that came with the CAN-bus interface, if it isn't already installed on your PC. If you have an older CAN-bus interface, you can also download a new driver from PEAK (www.peak-system.com). Set the baud rate to 125 Kbit/sec.

After the program started, turn the power to the CSA-32 module back on. The program window should look similar to the one below:

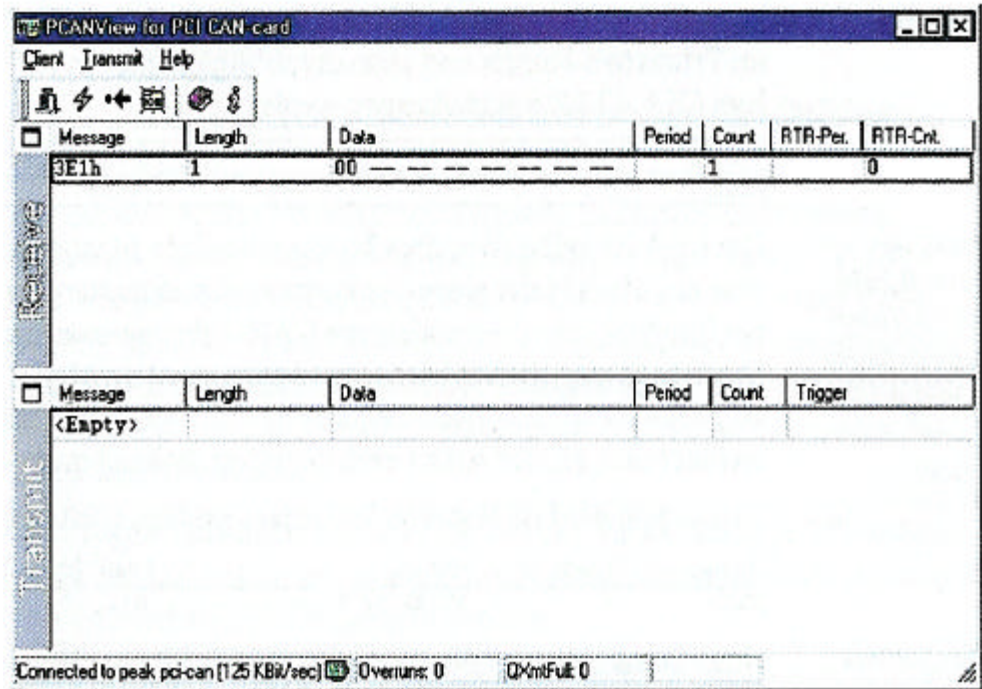


Fig. 8 PCANView window

In the **Message** column of the **Receive** pane, the address of the connected module is shown (**3E1**, for module address 1). See table below.

We will now send a command to set the module to operations mode **1** (for 32 inputs).

With the left mouse key, click anywhere on the **Transmit** pane and push the Insert key on the keyboard. A window opens up in which you enter the values **3D1 (ID)**, **1 (Length)** and **01 (Data)**. The data value is the mode you want to select:

- 01 = mode 1 (32 inputs)
- 02 = mode 2 (32 outputs)
- 03 = mode 3 (PTP-64 control)
- 04 = mode 4 (PLV-32 control)
- 05 = mode 5 (32 inputs as in mode 1 but with inverted logic, that is logic 1 is reported as 0 and vice a versa).

Note that the ID (3D1) is for a module with address 1 (DIP switch setting). Use the table below to find the ID for other addresses:

Adr.	ID	Adr.	ID	Adr.	ID	Adr.	ID
0	3D0	4	3D4	8	3D8	12	3DC
1	3D1	5	3D5	9	3D9	13	3DD
2	3D2	6	3D6	10	3DA	14	3DE
3	3D3	7	3D7	11	3DB	15	3DF

The “New Transit message” window looks as follows if module address 1 is used:

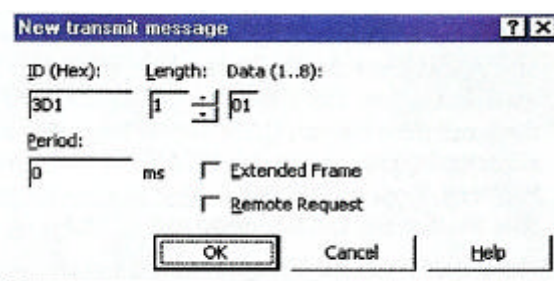


Fig. 9 CAN-bus send command

Setting the address to 0 (all DIP switches to on) resets the present mode (to 0). The module has to be powered off and on to take effect.

Click on **OK**. A corresponding CAN command appears in the **Transmit** pane and can now be sent to the CAN-32 module by double clicking on this command line.

Message	Length	Data	Period	Count	Trigger
3D1h	1	01 -- -- -- -- --	Wait	0	

The LED D1 should now be lit steady, except for short flashes while sending or receiving data. This indicates that the module accepted the mode request. This mode is now permanently stored and the LED D1 will be lit steadily when powered up the next time.

Moreover a new message is shown in the **Receive** pane:

Message	Length	Data	Period	Count	ATR-Per.	ATR-Cnt.
3E1h	4	FF FF FF FF -- -- --	11	3		0

In operating mode 5, the confirmation data is 00 00 00 00 (all inputs inverted).

In the **data** field the values **FF FF FF FF** are now shown which is the confirmation signal from the module that all 32 pins are now set as inputs, mode1. All input pins are set to logic 1 (high) as long as they remain

“open”, that is as long as nothing is connected to them.

Now take a 10kohm resistor and connect one end to socket K9, which is ground. Every time you connect the other end of the resistor to a pin on the socket K3 or K4 (except for pins 25 on K3 or pin 9 on K4) the LED D1 should turn off briefly and a new value should appear in the **data** field of the **Transmit** pane. Remove the resistor from the input pin again and **FF FF FF FF** should return.

To see whether the module also operates the pins as outputs, select mode **2**. Click again in the **Transmit** pane and hit the Insert key on the keyboard. Enter the values **3D1 (ID)**, **1 (Length)** and **02 (data)** and click on **OK**. Double click on the new line in the **Transmit** pane (for modules with different addresses consult above table for proper ID). The module should confirm this with **3E1 (ID)**, **1 (length)** and **02 (Data)**. All outputs should now be set to logic 0 (ground).

You can now set each output to any bit setting by sending the following command: **3D1 (ID)**, **4 (Length)** and four values of your choice (from 00 to FF). For example: to set the outputs to “on” and “off” alternatively (Bit settings 10 10 10.....), send the following command: **3D1 (ID)**, **4 (Length)**, **AA AA AA AA (Data)**. After the module’s LED flashed once the outputs at K3 and K4 should be configured as intended. Use a voltmeter to verify the output voltages (a bit value of 1 sets the corresponding output to +5V. A value of 0, to 0V). In this example, output 1 (pin 1 of K3) should have 0V, output 2: +5V, output 3: 0V, output 4: +5V and so on.

A CAN-bus command can be 8 bytes long. Each byte contains 8 bits. Rather than describing a byte as a chain of 8 zeros and ones, a system was developed that divides a byte in two groups of 4 bits. For each group a number or letter is assigned according to its value. This is referred to as hexadecimal notation.

Binary to hexadecimal conversion table:

0000 = 0 0100 = 4 1000 = 8 1100 = C
0001 = 1 0101 = 5 1001 = 9 1101 = D
0010 = 2 0110 = 6 1010 = A 1110 = E
0011 = 3 0111 = 7 1011 = B 1111 = F

A group of 0000 is indicated with a 0 where 1111 = F. A byte such as 10101010, separated in two groups 1010 and 1010 becomes AA in hexadecimal. Binary code 1111 1111 becomes FF.

The **(Length) 4** in our example indicates how many bytes are being sent (E.g. AA AA AA AA = 4 bytes at two groups each).

3.5 Inclusion in STP

STP can use CSA-32 modules currently in four different ways:

- As interface for occupancy detectors (track section module)
- To control signals (accessory module)
- To control switch board indicator bulbs (switch board module)
- As input device for switchboard push buttons (switch board module)

Setting the module to the mode required is done automatically by STP when switching to “Online” mode.

For the last three operating modes (signal control, indicator bulbs and push button inputs), the use of PLV-32 or PTP-64 modules respectively are a prerequisite, that is the bulbs/LED's and push buttons are not connected directly to the CSA-32 module. Please note that STP currently supports only 24 inputs for occupancy detectors, socket K4 cannot be used for this purpose.

Important Note: Every CSA-32 module connected to the same CAN-bus requires its own unique address (DIP switch S1), even if not used with STP.

CSA-32 modules including its address have to be entered in the STP “Parameter” window, according to the intended application (see above) as either:

CSA-24 as track section module, PLV-32/C as accessory module, CSA-32/T192 as switch board module using PTP-64 or CSA-32/L192 as switchboard module using PLV-32. Only one entry for each CSA-32 module is allowed.

The numbering of track sections, when used as occupancy detector interface, is shown at the bottom of the track section modules parameter window (e.g. “This module uses sections 17-40”). The individual section number is given by the connecting pin of the CSA-32 module (the detector connected to pin one would be STP section #17, pin 2 would be #18 etc., in the example above).

The address to be entered in STP for signals, switch board lights or push buttons comprises the CSA-32 address followed by a dot and by the connecting pin number of the bulbs/push buttons (1 -192). For example: A light bulb connected to output 12 of the second PLV-32, that is connected to a CSA-32 module with address #3 is entered as 3.44 (3 is the CSA-32 address, 44 is the 12th pin of the second PLV-32 module, since this module's pin numbers range from 33 to 64).

More information regarding addresses can be found in the STP manual.

For push buttons, an alternative method to writing the address is simply to operate the button and the address will be automatically read by STP and registered in the address field (needless to say that the affected CSA-32 module has to be powered up).

3.6 Trouble shooting

Here are a few hints in closing in on problem areas, should the module not function as expected.

If after powering up the module the LED doesn't light up, remove the power immediately and check the following:

- Are all IC's inserted all the way?
- Is the installed position of IC's correct (esp. IC1 & IC2)?
- Is rectifier (BR1) and condenser (C1) installed with correct polarity?
- Is the input voltage in the allowed range?
- Is the LED (D1) installed with correct polarity?

FAQ (Frequently asked question):

Q: A component gets hot and smokes

A: This or another component is installed in inverted position. Remove power immediately and check/replace component(s).

Q: The LED is not flashing when powered up for the first time but rather lit constantly.

A: Presumably, the module is already set to a specific operating mode. Set the module address to 0 (all switches of the DIP switch S1 to "on"), turn the power on (the LED should now be flashing) and off again. The operating mode is now reset to 0. Set your original address again.

Q: Some in/outputs can not be changed, they are stuck as either logic 1 or 0.

A: It is possible that one of the driver IC's (PCF8574) is defective. The IC's are assigned to the following output pins: IC4 = K3 pin 1 - 8, IC5 = K3 pin 9 - 16, IC6 = K3 pin 17 - 24, IC7 = K4 pin 1 - 8. Swap two of the IC's to see whether the problem follows one of them.

Q: The LED of the module flickers when turned on but no information appears in the PCANView **Receive** window.

A: Check the CAN-bus cable to the PC. Connect the MX1 in place of the CSA-32 to the CAN-bus and see if any information appears on the screen. If no, the problem is in the configuration of the CAN-bus interface or the CAN-bus cable. Also, check that the data transmission rate of PCANView is set to 125Kbit/sec.

Q: Even though the module starts up as it should, it doesn't react to any commands issued.

A: With PCANView, find out which ID the module sends on the CAN-bus during start-up. The last digit or letter is the address (1 - F), which has to be part of the ID when sending a command as well.

4. Appendix

4.1 Specifications

Dimensions:	80 x 100mm (sockets may project past the edge of the board)
Input voltage:	8 - 24V DC or AC; can also be supplied by CAN-bus connector
Current consumption:	25 mA
Max. Output current:	LOW: 25 mA HIGH: 300 mA
Ambient temperature:	0 - 60 C
Max. Humidity:	85%

4.2 Schematic

The exact component description can be found in the parts list on page 5.

The components IC9, K5, C6, C7, C8, C9, C10 and C11 are not used with this module version.

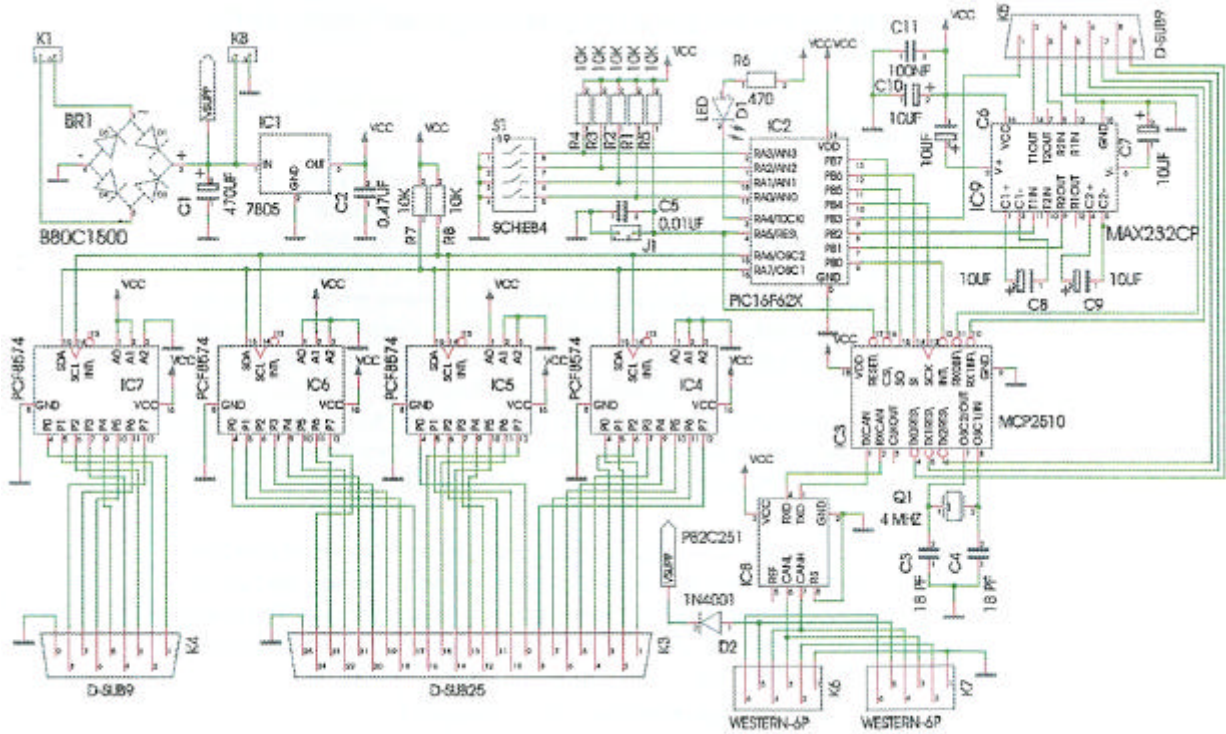


Fig. 10: CSA-32 Schematic

4.3 Operating environment

The following conditions apply for a trouble free operation of the CSA-32 module:

- Not to be used outside or in damp rooms
- The contact with water or other liquids must be prevented
- The unit may not be turned on should there be combustible gases in the area.
- Should the module have come in contact with water (e.g. condensation), get it inspected first by a qualified expert.
- The specified voltage ranges on the supply as well as the input/output side have to strictly adhered to.
- The ambient temperature may not be outside the range of 0 to +40C
- The module is to be protected against heat and cold

- The module is to be operated only with a qualified adult present.
- Only original parts are to be used for repairs
- The power to the module is to be turned off when not in use.

Please note that the warranty is lost if above conditions are not met.

4.4 Warranty

A 2-year warranty applies to this product. The warranty covers the free repair or replacement of components supplied, provided the failure is a direct result of poor material or workmanship. Our liability is limited to this module and we will not be responsible for any subsequent damage to other components that this unit is wired to, since we have no control of the assembly and connection of this module. We reserve the right to either repair, upgrade, replace the unit or reimburse the purchase price.

The warranty expires if:

- an unfit soldering iron; solder, solder past or flux is used containing acid.
- the assembly and soldering work is the cause of the products failure
- the installation manual and the schematic is not followed
- changes and repairs are attempted to this kit or a component
- unauthorized alterations to the component layout and wiring is attempted
- the boards current traces are destroyed or damaged
- parts installed with wrong polarity
- damaged by overloading the module
- connected to wrong power source
- damaged by unauthorized personnel
- misused
- damaged by electro static discharge