

TIP867-SW-82

Linux Device Driver

8 Channel RS485 Interface

Version 2.0.x

User Manual

Issue 2.0.2

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8 Channel RS485 Interface

Supported Modules:

TIP867

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1 Introduction

1.1 Device Driver

The TIP867-SW-82 Linux device driver allows the operation of a TIP867 IPAC module on Linux operating systems.

The TIP867-SW-82 device driver is based on standard Linux serial device drivers and supports all standard terminal functions (TERMIOS).

Because the TIP867 device driver is stacked on the TEWS TECHNOLOGIES IPAC carrier driver, it is necessary to install also the appropriate IPAC carrier driver. Please refer to the IPAC carrier driver user manual for further information.

The TIP867-SW-82 device driver supports the following features:

- Support for asynchronous mode only
- Standard baud rates up to 460800 baud
- Creates *TTY* devices *ttyST867_...* with dynamically allocated or fixed major device numbers
- Support for dynamic device file systems
- TEWS TECHNOLOGIES IPAC carrier driver support

The TIP867-SW-82 device driver supports the modules listed below:

TIP867-10	8 Channel RS485 Interface	IndustryPack® compatible
TIP867-20	8 Channel RS485 Interface plus 8 serial RS485 clock I/O lines	IndustryPack® compatible

To get more information about the features and use of the supported devices it is recommended to read the manuals listed below.

- TIP867 User manual
- TIP867 Engineering Manual
- CARRIER-SW-82 IPAC Carrier User Manual

1.2 IPAC Carrier Driver

IndustryPack (IPAC) carrier boards have different implementations of the system to IndustryPack bus bridge logic, different implementations of interrupt and error handling and so on. Also the different byte ordering (big-endian versus little-endian) of CPU boards will cause problems on accessing the IndustryPack I/O and memory spaces.

To simplify the implementation of IPAC device drivers which work with any supported carrier board, TEWS TECHNOLOGIES has designed a so called Carrier Driver that hides all differences of different carrier boards under a well defined interface.

The TEWS TECHNOLOGIES IPAC Carrier Driver CARRIER-SW-82 is part of this TIP867-SW-82 distribution. It is located in directory CARRIER-SW-82 on the corresponding distribution media.

This IPAC Device Driver requires a properly installed IPAC Carrier Driver. Due to the design of the Carrier Driver, it is sufficient to install the IPAC Carrier Driver once, even if multiple IPAC Device Drivers are used.

Please refer to the CARRIER-SW-82 User Manual for a detailed description how to install and setup the CARRIER-SW-82 device driver, and for a description of the TEWS TECHNOLOGIES IPAC Carrier Driver concept.

2 Installation

The directory TIP867-SW-82 on the distribution media contains the following files:

TIP867-SW-82-2.0.2.pdf	This manual in PDF format
TIP867-SW-82-SRC.tar.gz	Device Driver and Example sources
ChangeLog.txt	Release history
Release.txt	Release information

The GZIP compressed archive TIP867-SW-82-SRC.tar.gz contains the following files and directories:

Directory path './tip867/':

tip867.c	Driver source code
tip867def.h	Driver include file
makenode	Script to create device nodes on the file system
Makefile	Device driver make file
example/tip867exa.c	Example application
example/Makefile	Example application make file
include/config.h	Driver independent library header file
include/tpmodule.h	Kernel independent library header file
include/tpmodule.c	Kernel independent library source code file

In order to perform an installation, extract all files of the archive TIP867-SW-82-SRC.tar.gz to the desired target directory. The command 'tar -xzf TIP867-SW-82-SRC.tar.gz' will extract the files into the local directory.

Before building a new device driver, the TEWS TECHNOLOGIES IPAC carrier driver must be installed properly, because this driver includes the header file ipac_carrier.h, which is part of the IPAC carrier driver distribution. Please refer to the IPAC carrier driver user manual in the directory path CARRIER-SW-82 on the separate distribution media.

2.1 Build and install the device driver

- Login as *root*
- Change to the target directory
- To create and install the driver in the module directory */lib/modules/<version>/misc* enter:

make install

For Linux kernel 2.6.x, there may be compiler warnings claiming some undefined ipac_* symbols. These warnings are caused by the IPAC carrier driver, which is unknown during compilation of this TIP driver. The warnings can be ignored.

- Also after the first build we have to execute *depmod* to create a new dependency description for loadable kernel modules. This dependency file is later used by *modprobe* to automatically load the correct IPAC carrier driver modules.

```
# depmod -aq
```

2.2 Uninstall the device driver

- Login as *root*
- Change to the target directory
- To remove the driver from the module directory */lib/modules/<version>/misc* enter:

```
# make uninstall
```

- Update kernel module dependency description file

```
# depmod -aq
```

2.3 Install device driver into the running kernel

- To load the device driver into the running kernel, login as root and execute the following commands:

```
# modprobe tip867drv
```

- After the first build or if you are using dynamic major device allocation it is necessary to create new device nodes on the file system. Please execute the script file *makenode* to do this. If your kernel has enabled a device file system (*devfs* or *sysfs* with *udev*) then you have to skip running the *makenode* script. Instead of creating device nodes from the script the driver itself takes creating and destroying of device nodes in its responsibility.

```
# sh makenode
```

On success the device driver will create eight minor devices for each TIP867 module found. The first TIP867 (channel 1...8) can be accessed through device nodes */dev/ttyST867_0.../dev/ttyST867_7*, the second TIP867 (channel 1...8) through device nodes */dev/ttyST867_8.../dev/ttyST867_15* and so on.

The allocation of device nodes to physical TIP867 modules depends on the search order of the IPAC carrier driver. Please refer to the IPAC carrier user manual.

Loading of the TIP867 device driver will only work if kernel KMOD support is installed, necessary carrier board drivers are already installed and the kernel dependency file is up to date. If KMOD support isn't available you have to build either a new kernel with KMOD installed or you have to install the IPAC carrier kernel modules manually in the correct order (please refer to the IPAC carrier driver user manual).

2.4 Remove device driver from the running kernel

- To remove the device driver from the running kernel login as root and execute the following command:

```
# modprobe -r tip867drv
```

If your kernel has enabled a dynamic device file system all TIP867 device nodes will be automatically removed from your file system after this.

Be sure that the driver isn't opened by any application program. If opened you will get the response "*tip867drv: Device or resource busy*" and the driver will still remain in the system until you close all opened files and execute *modprobe -r* again.

2.5 Change Major Device Number

This section is only relevant for kernels without devfs enabled.

The TIP867 driver use dynamic allocation of major device numbers by default. If this isn't suitable for the application it's possible to define a major number for the driver.

To change a certain major number edit the file tip867.c, change the following symbol to an appropriate value and enter **make install** to create a new driver.

TIP867_TTY_MAJOR Defines the value for the terminal device. Valid numbers are in range between 0 and 255. A value of 0 means dynamic number allocation.

Example:

```
#define TIP867_TTY_MAJOR          122
```

Be sure that the desired major number isn't used by other drivers. Please check /proc/devices to see which numbers are free.

Keep in mind that it is necessary to create new device nodes if the major number for the TIP867 driver has changed.

2.6 Number of supported devices

By default the TIP867 device driver supports up to 16 minor devices (serial channels). If this isn't enough the number of supported TIP867 modules respective the number of minor devices can be increased by modifying the macro **NUM_TIP867** in file tip867.c.

3 Device Driver Programming

The TIP867-SW-82 driver is based on the standard Linux terminal driver. Due to this way of implementation the driver interface and functionality is compatible to the standard Linux terminal driver.

Please refer to the TERMIOS man page and driver programming related man pages for more information about serial driver programming.

4 Diagnostic

If the TIP867 driver does not work properly it is helpful to get some status information from the driver respective kernel.

The Linux /proc file system provides information about kernel, resources, driver, devices and so on. The following screen dumps display information of a correct running TIP867 driver (see also the proc man pages).

```
# cat /proc/tty/driver/tip867
```

```
TEWS TECHNOLOGIES - TIP867 driver: 2.0.1
0: uart:Z85230 port:0x1 baud:9600 tx:0 rx:0
1: uart:Z85230 port:0x5 baud:9600 tx:0 rx:0
2: uart:Z85230 port:0x9 baud:9600 tx:0 rx:0
3: uart:Z85230 port:0xD baud:9600 tx:0 rx:0
4: uart:Z85230 port:0x11 baud:9600 tx:0 rx:0
5: uart:Z85230 port:0x15 baud:9600 tx:0 rx:0
6: uart:Z85230 port:0x19 baud:9600 tx:0 rx:0
7: uart:Z85230 port:0x1D baud:9600 tx:0 rx:0
8: uart:Z85230 port:0x1 baud:9600 tx:0 rx:0
9: uart:Z85230 port:0x5 baud:9600 tx:0 rx:0
10: uart:Z85230 port:0x9 baud:9600 tx:0 rx:0
11: uart:Z85230 port:0xD baud:9600 tx:0 rx:0
12: uart:Z85230 port:0x11 baud:9600 tx:0 rx:0
13: uart:Z85230 port:0x15 baud:9600 tx:0 rx:0
14: uart:Z85230 port:0x19 baud:9600 tx:0 rx:0
15: uart:Z85230 port:0x1D baud:9600 tx:0 rx:0
```

```
# cat /proc/tty/drivers
```

```
/dev/tty          /dev/tty          5          0 system:/dev/tty
/dev/console      /dev/console      5          1 system:console
/dev/ptmx         /dev/ptmx         5          2 system
/dev/vc/0         /dev/vc/0         4          0 system:vtmaster
tip867           /dev/ttyST867    254       0-15 serial
serial           /dev/ttyS         4          64-71 serial
```

```
# cat /proc/tews-ip-carrier
```

```
TEWS TECHNOLOGIES - IPAC Carrier Class Driver version 1.3.2 (2007-02-26)
```

```
Registered IP slots:
```

```
[TEWS TECHNOLOGIES - (Compact)PCI IPAC Carrier - Slot 0]
```

```
Plugged Module      Vendor=0xB3, Modul=0x24
Installed Driver     TIP867 - 8 Channel RS485 Interface
Slot Setup          INT0_EN | INT1_EN | LEVEL_SENS | CLK_8MHZ |
                   Memory Size = 0x0

Interrupt Vector     System=5, Module=5
Interrupt Level      INT0=0, INT1=0
ID Space Addr        Physical=0xec821080, Virtual=0x26db5080
IO Space Addr        Physical=0xec821000, Virtual=0x26dcc000
MEM8 Space Addr      Physical=0xec000000, Virtual=0x00000000
MEM16 Space Addr     Physical=0xeb000000, Virtual=0x00000000
```

[TEWS TECHNOLOGIES - (Compact)PCI IPAC Carrier - Slot 1]

```
Plugged Module      Vendor=0xB3, Modul=0x24
Installed Driver     TIP867 - 8 Channel RS485 Interface
Slot Setup          INT0_EN | INT1_EN | LEVEL_SENS | CLK_8MHZ |
                   Memory Size = 0x0

Interrupt Vector     System=5, Module=5
Interrupt Level      INT0=0, INT1=0
ID Space Addr        Physical=0xec821180, Virtual=0x26df6180
IO Space Addr        Physical=0xec821100, Virtual=0x26df8100
MEM8 Space Addr      Physical=0xec400000, Virtual=0x00000000
MEM16 Space Addr     Physical=0xeb800000, Virtual=0x00000000
```

Registered Carrier Drivers:

TEWS TECHNOLOGIES - (Compact)PCI IPAC Carrier V1.3.1