

# PKU keypads

## CANopen user manual



**PKU2200**



**PKU2400**

## Summary:

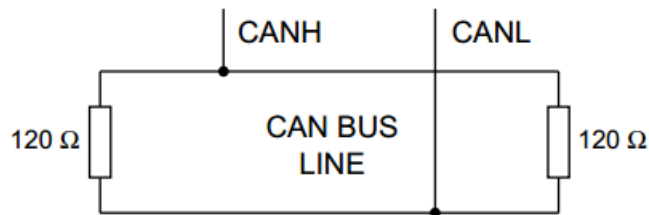
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## 1. How to connect Deutsch 4 pin:



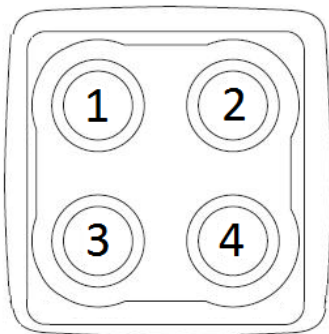
| PIN | COLOUR | FUNCTION         |
|-----|--------|------------------|
| 1   | Green  | CAN L            |
| 2   | Yellow | CAN H            |
| 3   | Black  | Negative battery |
| 4   | Red    | Vbatt. (12-24V)  |



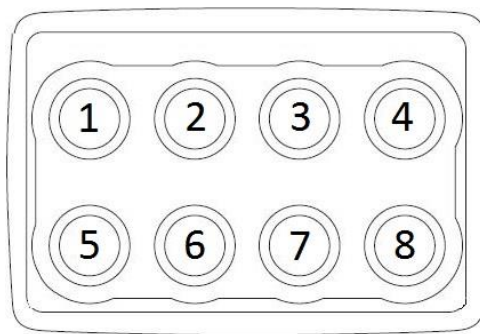
Each end of the CAN bus is terminated with  $120\Omega$  resistors in compliance with the standard to minimize signal reflections on the bus. You may need to place a  $120\Omega$  resistor between CAN-L and CAN-H.

## 2. Reference

Front view.



PKU2200



PKU2400

### 3. Default settings

| Setting                       | Default status or level  | How to change            |
|-------------------------------|--------------------------|--------------------------|
| Baud Rate                     | 125 kbit/s               | Object 6500h Command 11h |
| CANopen Node ID               | 15h                      | Object 6500h Command 70h |
| Device active on startup      | Not active               | Object 6500h Command 10h |
| Key Brightness                | 3Fh (Maximum Brightness) | Object 6500h Command 02h |
| Backlight Brightness          | 00h (OFF)                | Object 6500h Command 03h |
| Backlight Color               | Amber                    | Object 6500h Command 7Dh |
| Startup LED Light Show        | Complete LED Sequence    | Object 6500h Command 50h |
| Periodic Message Transmission | Disable                  | Object 6500h Command 12h |
| DEMO mode                     | Disable                  | Object 6500h Command 7Ah |
| Heartbeat Message             | Disable                  | Object 1017h             |
| Boot-up service               | Active                   | Object 6500h Command 13h |

### NMT MESSAGES

The Network Management messages follow a master-slave structure. Through NMT services, CANopen devices are initialized, started, reset or stopped. All CANopen devices are regarded as NMT slaves. NMT messages have CAN-ID always equal to 00h.

### 4. Start CANopen node (keypad activation message)

|            |     |   |
|------------|-----|---|
| Identifier | 00h |   |
| Byte 0     | 01h | Start CANopen node  |
| Byte 1     | XXh | Keypad CAN ID<br>00h: start all the keypads<br>15h: start the keypad with CAN ID = 15h. |
| Byte 2, 7  | 00h | Not used  |

Example:

| Direction | Identifier | Format | Message |
|-----------|------------|--------|---------|
| To Keypad | 0          | Std    | 01 15   |

### 5. Enter pre-operational

|            |     |   |
|------------|-----|---|
| Identifier | 00h |   |
| Byte 0     | 80h | Enter pre-operational   |
| Byte 1     | XXh | Keypad CAN ID<br>00h: enter all the keypads<br>15h: enter the keypad with CAN ID = 15h. |
| Byte 2, 7  | 00h | Not used  |

Example:

| Direction | Identifier | Format | Message |
|-----------|------------|--------|---------|
| To Keypad | 0          | Std    | 80 15   |

## 6. Reset CANopen node

|            |     |   |
|------------|-----|---|
| Identifier | 00h |   |
| Byte 0     | 81h | Reset CANopen node  |
| Byte 1     | XXh | Keypad CAN ID<br>00h: reset all the keypads<br>15h: reset the keypad with CAN ID = 15h. |
| Byte 2, 7  | 00h | Not used  |

Example:

| Direction | Identifier | Format | Message |
|-----------|------------|--------|---------|
| To Keypad | 0          | Std    | 81 15   |

## 7. Stop CANopen node

|            |     |   |
|------------|-----|---|
| Identifier | 00h |   |
| Byte 0     | XXh | 02h: Stop CANopen node<br>00h: Stop CANopen node (old sw compatibility)               |
| Byte 1     | YYh | Keypad CAN ID<br>00h: stop all the keypads<br>15h: stop the keypad with CAN ID = 15h. |
| Byte 2, 7  | 00h | Not used  |

Example:

| Direction | Identifier | Format | Message |
|-----------|------------|--------|---------|
| To Keypad | 0          | Std    | 02 15   |

## 8. Boot-up service

This service is used to signal that a NMT slave has entered the NMT state Pre-operational.

|            |                       |  |
|------------|-----------------------|--|
| Identifier | 700h + current CAN ID | Default 715h                               |
| Byte 0     | 00h                   | One data byte is transmitted with value 0. |

Example:

| Direction   | Identifier | Format | Message |
|-------------|------------|--------|---------|
| From Keypad | 715h       | Std    | 00h     |

The keypad with CAN ID 15h has entered the NMT state Pre-operational.

## 9. Heartbeat message

The heartbeat mechanism for a CANopen device is established by cyclically transmitting the heartbeat message by the heartbeat producer. One or more CANopen devices in the network are aware of this heartbeat message. If the heartbeat cycle fails for the heartbeat producer the local application on the heartbeat consumer will be informed about that event.

If a CANopen device starts with a value for the heartbeat producer time unequal to 0 the boot-up message is regarded as first heartbeat message.

|            |                       |  |
|------------|-----------------------|--|
| Identifier | 700h + current CAN ID | Default 715h   |
| Byte 0     | XXh                   | XXh: State of heartbeat producer<br>00h: Boot-up<br>05h: Operational<br>7Fh: Pre-operational |

Example:

| Direction   | Identifier | Format | Message | Data                          |
|-------------|------------|--------|---------|-------------------------------|
| From Keypad | 715h       | Std    | 00h     | Boot up                       |
| From Keypad | 715h       | Std    | 7Fh     | Pre-operational               |
| To keypad   | 00h        | Std    | 01h 15h | Start keypad with CAN id =15h |
| From Keypad | 715h       | Std    | 05h     | Operational                   |

## PDO messages

PDO (Process Data Object) are fast telegram messages that can simply manage most important functions. There are no answers for this kind of messages. Each PDO message has an equivalent Service Data Object message.

### 10. Keys status message

The keypad must be activated, see NMT Start CANopen Node message.

- **PKU 2200**

|            |   |                   |
|------------|---|-------------------|
| Identifier | 180 + current CAN ID                        | Default 195h      |
| Byte 0     | Keys from #1 to #4<br>0 0 0 0 - K4 K3 K2 K1 | Keys: 1=on; 0=off |
| Byte 1, 3  | 00h   | Not used          |
| Byte 4     | XXh   | Tick Timer        |

Examples:

| Direction   | Identifier | Format | Message        | Key state              |
|-------------|------------|--------|----------------|------------------------|
| From Keypad | 195        | Std    | 00 00 00 00 XX | No key pressed         |
| From Keypad | 195        | Std    | 04 00 00 00 XX | Key #3 pressed         |
| From Keypad | 195        | Std    | 02 00 00 00 XX | Key #2 pressed         |
| From Keypad | 195        | Std    | 05 00 00 00 XX | Keys #1 and #3 pressed |

- **PKU 2400**

|            |   |                     |
|------------|---|---------------------|
| Identifier | 180 + current CAN ID                            | Default 195h        |
| Byte 0     | Keys from #1 to #8<br>K8 K7 K6 K5 - K4 K3 K2 K1 | Keys: 1= on; 0= off |
| Byte 1, 3  | 00h   | Not used            |
| Byte 4     | XXh   | Tick Timer          |

Examples:

| Direction   | Identifier | Format | Message        | Key state              |
|-------------|------------|--------|----------------|------------------------|
| From Keypad | 195        | Std    | 00 00 00 00 XX | No key pressed         |
| From Keypad | 195        | Std    | 01 00 00 00 XX | Key #1 pressed         |
| From Keypad | 195        | Std    | 02 00 00 00 XX | Key #2 pressed         |
| From Keypad | 195        | Std    | 42 00 00 00 XX | Keys #7 and #2 pressed |



## 11. Set LED ON message

- **PKU 2200**

|            |                           |                   |
|------------|---------------------------|-------------------|
| Identifier | 200 + current CAN ID      | Default 215h      |
| Byte 0     | G4 G3 G2 G1 – R4 R3 R2 R1 | Green and Red LED |
| Byte 1     | 0 0 0 0 – B4 B3 B2 B1     | Blue LED          |
| Byte 2,7   | 00h                       | Not used          |

Examples:

| Direction | Identifier | Format | Message                 | LED                                     |
|-----------|------------|--------|-------------------------|---|
| To Keypad | 215        | Std    | 00 00 00 00 00 00 00 00 | Turn off all the LED                    |
| To Keypad | 215        | Std    | 01 00 00 00 00 00 00 00 | Only red LED #1 on                      |
| To Keypad | 215        | Std    | 03 00 00 00 00 00 00 00 | Red LED #1 and # 2 on,<br>other LED off |
| To Keypad | 215        | Std    | 80 00 00 00 00 00 00 00 | Only green LED #4 on                    |
| To Keypad | 215        | Std    | 00 01 00 00 00 00 00 00 | Only blue LED #1 on                     |

- **PKU 2400**

|            |                           |              |
|------------|---------------------------|--------------|
| Identifier | 200 + current CAN ID      | Default 215h |
| Byte 0     | R8 R7 R6 R5 - R4 R3 R2 R1 | Red LED      |
| Byte 1     | G8 G7 G6 G5 - G4 G3 G2 G1 | Green LED    |
| Byte 2     | B8 B7 B6 B5 - B4 B3 B2 B1 | Blue LED     |
| Byte 3,7   | 00h                       | Not used     |

Examples:

| Direction | Identifier | Format | Message                 | LED                                      |
|-----------|------------|--------|-------------------------|--|
| To Keypad | 215        | Std    | 00 00 00 00 00 00 00 00 | Turn off all the LED                     |
| To Keypad | 215        | Std    | 01 00 00 00 00 00 00 00 | Only red LED #1 on                       |
| To Keypad | 215        | Std    | 42 00 00 00 00 00 00 00 | Red LED #2 and #7 on, other<br>LED off   |
| To Keypad | 215        | Std    | 80 00 00 00 00 00 00 00 | Only red LED #8 on                       |
| To Keypad | 215        | Std    | 00 10 00 00 00 00 00 00 | Only green LED #5 on                     |
| To Keypad | 215        | Std    | 00 11 00 00 00 00 00 00 | Green LED #1 and #5 on,<br>other LED off |
| To Keypad | 215        | Std    | 00 00 06 00 00 00 00 00 | Blue LED #2 and #3 on,<br>other LED off  |
| To Keypad | 215        | Std    | 59 6A 74 00 00 00 00 00 | One color for each button<br>from 1 to 7 |

## 12. Set LED Blink message

Note: if the blink message is sent when the LED is already ON, the LED blinks in alternate mode.

- **PKU 2200**

|            |                           |                   |
|------------|---------------------------|-------------------|
| Identifier | 300 + current CAN ID      | Default 315h      |
| Byte 0     | G4 G3 G2 G1 – R4 R3 R2 R1 | Green and Red LED |
| Byte 1     | 0 0 0 0 – B4 B3 B2 B1     | Blue LED          |
| Byte 2,7   | 00h                       | Not used          |

Examples:

| Direction | Identifier | Format | Message                 | LED                      |
|-----------|------------|--------|-------------------------|--------------------------|
| To Keypad | 315        | Std    | 00 00 00 00 00 00 00 00 | No LED blinks            |
| To Keypad | 315        | Std    | 01 00 00 00 00 00 00 00 | Only red LED #1 blinks   |
| To Keypad | 315        | Std    | 02 00 00 00 00 00 00 00 | Only red LED #2 blinks   |
| To Keypad | 315        | Std    | 80 00 00 00 00 00 00 00 | Only green LED #4 blinks |
| To Keypad | 315        | Std    | 00 01 00 00 00 00 00 00 | Only blue LED #1 blinks  |

- **PKU 2400**

|            |                           |              |
|------------|---------------------------|--------------|
| Identifier | 300 + current CAN ID      | Default 315h |
| Byte 0     | R8 R7 R6 R5 - R4 R3 R2 R1 | Red LED      |
| Byte 1     | G8 G7 G6 G5 - G4 G3 G2 G1 | Green LED    |
| Byte 2     | B8 B7 B6 B5 - B4 B3 B2 B1 | Blue LED     |
| Byte 3,7   | 00h                       | Not used     |

Examples:

| Direction | Identifier | Format | Message                 | LED                             |
|-----------|------------|--------|-------------------------|---------------------------------|
| To Keypad | 315        | Std    | 00 00 00 00 00 00 00 00 | No LED blinks                   |
| To Keypad | 315        | Std    | 01 00 00 00 00 00 00 00 | Only red LED #1 blinks          |
| To Keypad | 315        | Std    | 42 00 00 00 00 00 00 00 | Only red LED #2 and #7 blink    |
| To Keypad | 315        | Std    | 80 00 00 00 00 00 00 00 | Only red LED #8 blinks          |
| To Keypad | 315        | Std    | 00 10 00 00 00 00 00 00 | Only green LED #5 blinks        |
| To Keypad | 315        | Std    | 00 11 00 00 00 00 00 00 | Only green LED #1 and #5 blink. |
| To Keypad | 315        | Std    | 00 00 06 00 00 00 00 00 | Only blue LED #2 and #3 blink.  |

## SDO Messages:

A SDO (Service Data Object) is providing direct access to object entries of a CANopen device's object dictionary.

### 13. Object 6500h: Command Module

#### a) Set single LED state: 01h

|            |                       |   |
|------------|-----------------------|---|
| Identifier | 600h + current CAN ID | Default 615h                            |
| Byte 0     | 23h                   | Set Device Register                     |
| Byte 1     | 00h                   | CAN Object 6500h                        |
| Byte 2     | 65h                   |   |
| Byte 3     | 01h                   |   |
| Byte 4     | 01h                   | Sub index                               |
| Byte 5     | XXh                   | Command: Set single LED state           |
| Byte 5     | XXh                   | Key Number (01-04h) for PKU 2200        |
|            |                       | Key Number (01-08h) for PKU 2400        |
|            |                       | Key Number (01-0Ch) for PKU 2600        |
| Byte 6     | 00h                   | OFF                                     |
|            | 01h – 03h             | Red: 01h on; 02h blink; 03h alt blink   |
|            | 04h – 06h             | Green: 04h on; 05h blink; 06h alt blink |
|            | 07h – 09h             | Blue: 07h on; 08h blink; 09h alt blink  |
|            | 0Ah                   | RED/GREEN blink 0Ah                     |
|            | 0Ch                   | AMBER/RED blink 0Ch                     |
| 0Eh        | GREEN/AMBER blink 0Eh |   |
| Byte 7     | 00h                   | Not used                                |

Examples:

| Direction    | Identifier | Format | Message                 | Data                   |
|--------------|------------|--------|-------------------------|------------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 01 08 01 00 | Switch on LED #8 red   |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 | Switch off LED         |
| To Keypad    | 615        | Std    | 23 00 65 01 01 09 04 00 | Switch on LED #9 green |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 09 07 00 | Switch on LED #9 blue  |

#### b) Set LED brightness level: 02h

|            |                       |   |
|------------|-----------------------|---|
| Identifier | 600h + current CAN ID | Default 615h                              |
| Byte 0     | 23h                   | Set Device Register                       |
| Byte 1     | 00h                   | CAN Object 6500h                          |
| Byte 2     | 65h                   |   |
| Byte 3     | 01h                   |   |
| Byte 4     | 02h                   | Sub index                                 |
| Byte 5     | XXh                   | Command: Set LED brightness               |
| Byte 6     | XXh                   | Intensity 00h-3Fh → min – 100% brightness |
| Byte 6,7   | 00h                   | Not used                                  |

Example:

| Direction    | Identifier | Format | Message                 | Data             |
|--------------|------------|--------|-------------------------|------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 02 10 00 00 | Brightness = 25% |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                  |

**c) Set backlight brightness level: 03h**

|            |                       |   |
|------------|-----------------------|---|
| Identifier | 600h + current CAN ID | Default 615h                            |
| Byte 0     | 23h                   | Set Device Register                     |
| Byte 1     | 00h                   | CAN Object 6500h                        |
| Byte 2     | 65h                   |   |
| Byte 3     | 01h                   | Sub index                               |
| Byte 4     | 03h                   | Command: Set backlight brightness       |
| Byte 5     | XXh                   | Intensity 00h-3Fh → 0 – 100% brightness |
| Byte 6,7   | 00h                   | Not used                                |

Example:

| Direction    | Identifier | Format | Message                 | Data                       |
|--------------|------------|--------|-------------------------|----------------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 03 2F 00 00 | Backlight brightness = 75% |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                            |

**d) Set backlight color: 04h**

|            |                       |   |
|------------|-----------------------|---|
| Identifier | 600h + current CAN ID | Default 615h  |
| Byte 0     | 23h                   | Set Device Register   |
| Byte 1     | 00h                   | CAN Object 6500h  |
| Byte 2     | 65h                   |   |
| Byte 3     | 01h                   | Sub index   |
| Byte 4     | 04h                   | Command: Set backlight color  |
| Byte 5     | XXh                   | Color<br>01h: red<br>02h: green<br>03h: blue<br>04h: yellow<br>05h: cyan<br>06h: violet<br>07h: white<br>08h: amber/orange<br>09h: yellow/green |
| Byte 6,7   | 00h                   | Not used  |

Example:

| Direction    | Identifier | Format | Message                 | Data                |
|--------------|------------|--------|-------------------------|---------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 04 01 00 00 | Red Backlight color |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                     |

**e) Set device active on startup: 10h**

If keypad is active on startup don't need Start command from host

|            |                       |                                       |
|------------|-----------------------|---------------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                          |
| Byte 0     | 23h                   | Set Device Register                   |
| Byte 1     | 00h                   | CAN Object 6500h                      |
| Byte 2     | 65h                   |                                       |
| Byte 3     | 01h                   |                                       |
| Byte 4     | 10h                   | Sub index                             |
| Byte 5     | XXh                   | Command: Set device active on startup |
|            |                       | 00h: Not active                       |
|            |                       | 01h: Active                           |
| Byte 6,7   | 00h                   | Not used                              |

Example:

| Direction    | Identifier | Format | Message                 | Data                         |
|--------------|------------|--------|-------------------------|------------------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 10 01 00 00 | Set device active on startup |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                              |

**f) Set device baud rate: 11h**

|            |                       |                        |
|------------|-----------------------|------------------------|
| Identifier | 600h + current CAN ID | Default 615h           |
| Byte 0     | 23h                   | Set Device Register    |
| Byte 1     | 00h                   | CAN Object 6500h       |
| Byte 2     | 65h                   |                        |
| Byte 3     | 01h                   |                        |
| Byte 4     | 11h                   | Sub index              |
| Byte 5     | XXh                   | Command: Set baud rate |
|            |                       | 00h: 125k (default)    |
|            |                       | 01h: 250k              |
|            |                       | 02h: 500k              |
| Byte 6,7   | 00h                   | Not used               |

Example:

| Direction    | Identifier | Format | Message                 | Data             |
|--------------|------------|--------|-------------------------|------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 11 01 00 00 | Baud rate = 250k |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                  |

**g) Set periodic transmission: 12h**

Note: the keypad must be activated, see NMT messages.

|            |                       |                                |
|------------|-----------------------|--------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                   |
| Byte 0     | 23h                   | Set Device Register            |
| Byte 1     | 00h                   | CAN Object 6500h               |
| Byte 2     | 65h                   |                                |
| Byte 3     | 01h                   |                                |
| Byte 4     | 12h                   | Sub index                      |
| Byte 5     | XXh                   | Command: Set periodic messages |
| Byte 6     | YYh                   | 00h: off; 01h: on              |
| Byte 7     | 00h                   | Period in milliseconds ÷ 10    |
| Byte 7     | 00h                   | Not used                       |

Example:

| Direction    | Identifier | Format | Message                 | Data            |
|--------------|------------|--------|-------------------------|-----------------|
| To Keypad    | 615        | Std    | 23 00 65 01 12 01 32 00 | Period = 500 ms |
| Keypad Reply | 195        | Std    | 60 00 65 01 00 00 00 00 |                 |

### h) Set Boot-up service: 13h

|            |                       |                              |
|------------|-----------------------|------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                 |
| Byte 0     | 23h                   | Set Device Register          |
| Byte 1     | 00h                   | CAN Object 6500h             |
| Byte 2     | 65h                   |                              |
| Byte 3     | 01h                   |                              |
| Byte 4     | 13h                   | Command: Set Boot-up service |
| Byte 5     | XXh                   | 00h: Not active              |
|            |                       | 01h: Active                  |
| Byte 6,7   | 00h                   | Not used                     |

Example:

| Direction    | Identifier | Format | Message                 | Data                           |
|--------------|------------|--------|-------------------------|--------------------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 13 00 00 00 | Set Boot-up service not active |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                                |

### i) Set CANopen node ID: 70h

|            |                       |                               |
|------------|-----------------------|-------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                  |
| Byte 0     | 23h                   | Set Device Register           |
| Byte 1     | 00h                   | CAN Object 6500h              |
| Byte 2     | 65h                   |                               |
| Byte 3     | 01h                   |                               |
| Byte 4     | 70h                   | Command: Set CAN ID           |
| Byte 5     | XXh                   | New ID (00h-7Fh), default 15h |
| Byte 6,7   | 00h                   | Not used                      |

Example:

| Direction    | Identifier | Format | Message                 | Data        |
|--------------|------------|--------|-------------------------|-------------|
| To Keypad    | 615        | Std    | 23 00 65 01 70 18 00 00 | New Id = 18 |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |             |

The first reply is with the old node ID.

### j) Set default startup LED light level: 7Ch

|            |                       |                                |
|------------|-----------------------|--------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                   |
| Byte 0     | 23h                   | Set Device Register            |
| Byte 1     | 00h                   | CAN Object 6500h               |
| Byte 2     | 65h                   |                                |
| Byte 3     | 01h                   |                                |
| Byte 4     | 7Ch                   | Command: Set startup LED level |
| Byte 5     | XXh                   | 0-3Fh → min-100%               |
| Byte 6,7   | 00h                   | Not used                       |

Example:

| Direction    | Identifier | Format | Data                    |      |
|--------------|------------|--------|-------------------------|------|
| To Keypad    | 615        | Std    | 23 00 65 01 7C 3F 00 00 | 100% |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |      |

### k) Set default startup backlight level: 7Bh

|            |                       |                              |
|------------|-----------------------|------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                 |
| Byte 0     | 23h                   | Set Device Register          |
| Byte 1     | 00h                   | CAN Object 6500h             |
| Byte 2     | 65h                   |                              |
| Byte 3     | 01h                   |                              |
| Byte 4     | 7Bh                   | Command: Set backlight level |
| Byte 5     | XXh                   | 0-3Fh → 0 – 100% brightness  |
| Byte 6,7   | 00h                   | Not used                     |

Example:

| Direction    | Identifier | Format | Message                 | Data                      |
|--------------|------------|--------|-------------------------|---------------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 7B 00 00 00 | Backlight = 0% at startup |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                           |

### l) Set default startup backlight color: 7Dh

|            |                       |   |
|------------|-----------------------|---|
| Identifier | 600h + current CAN ID | Default 615h  |
| Byte 0     | 23h                   | Set Device Register   |
| Byte 1     | 00h                   | CAN Object 6500h  |
| Byte 2     | 65h                   |   |
| Byte 3     | 01h                   |   |
| Byte 4     | 7Dh                   | Command: Set backlight color  |
| Byte 5     | XXh                   | Color<br>01h: red<br>02h: green<br>03h: blue<br>04h: yellow<br>05h: cyan<br>06h: violet<br>07h: white<br>08h: amber/orange<br>09h: yellow/green |
| Byte 6,7   | 00h                   | Not used  |

Example:

| Direction    | Identifier | Format | Message                 | Data                           |
|--------------|------------|--------|-------------------------|--------------------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 7D 01 00 00 | Red Backlight color at startup |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                                |

### m) Set DEMO mode: 7Ah

Not Yet Available

Demo mode is a special feature that consist in different LED states for each button pressing.

Disconnect and reconnect the keypad to enter this mode.

|            |                              |                        |
|------------|------------------------------|------------------------|
| Identifier | 615h (600h + current CAN ID) |                        |
| Byte 0     | 23h                          | Set Device Register    |
| Byte 1     | 00h                          | CAN Object 6500h       |
| Byte 2     | 65h                          |                        |
| Byte 3     | 01h                          | Sub index              |
| Byte 4     | 7Ah                          | Command: Set DEMO mode |
| Byte 5     | XXh                          | 01h: on                |
|            |                              | 00h: off               |
| Byte 6,7   | 00h                          | Not used               |

Example:

| Direction    | Identifier | Format | Message                 | Data             |
|--------------|------------|--------|-------------------------|------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 7A 01 00 00 | Set demo mode on |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                  |

### n) Set startup LED show: 50h

|            |                       |                                  |
|------------|-----------------------|----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                     |
| Byte 0     | 23h                   | Set Device Register              |
| Byte 1     | 00h                   | CAN Object 6500h                 |
| Byte 2     | 65h                   |                                  |
| Byte 3     | 01h                   | Sub index                        |
| Byte 4     | 50h                   | Command: Set startup LED show    |
| Byte 5     | XXh                   | 01h: Complete LED Show (default) |
|            |                       | 02h: Amber fast flash            |
|            |                       | 03h: Disable                     |
| Byte 6,7   | 00h                   | Not used                         |

Example:

| Direction    | Identifier | Format | Message                 | Data                     |
|--------------|------------|--------|-------------------------|--------------------------|
| To Keypad    | 615        | Std    | 23 00 65 01 50 03 00 00 | Startup LED show disable |
| Keypad Reply | 595        | Std    | 60 00 65 01 00 00 00 00 |                          |



## 14. Object 6000h: Digital input module, keys states

This module contains all the Switch State information.

A one indicates the switch is on, a zero indicates the switch is off.

The keypad must be enabled, see NMT messages.

- **PKU 2200**

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 00h                   | CAN Object 6000h     |
| Byte 2     | 60h                   |                      |
| Byte 3     | 00h                   | Sub index            |
| Byte 4,7   | 00h                   | Not used             |

Examples:

| Direction    | Identifier | Format | Message                 | Data                   |
|--------------|------------|--------|-------------------------|------------------------|
| To Keypad    | 615        | Std    | 40 00 60 00 00 00 00 00 |                        |
| Keypad reply | 595        | std    | 43 00 60 00 00 00 00 00 | No key pressed         |
|              |            |        | 43 00 60 00 01 00 00 00 | Key 1 pressed          |
|              |            |        | 43 00 60 00 02 00 00 00 | Key 2 pressed          |
|              |            |        | 43 00 60 00 04 00 00 00 | Key 3 pressed          |
|              |            |        | 43 00 60 00 08 00 00 00 | Key 4 pressed          |
|              |            |        | 43 00 60 00 03 00 00 00 | Key 1 and 2 pressed    |
|              |            |        | 43 00 60 00 0A 00 00 00 | Key 2 and 4 pressed    |
|              |            |        | 43 00 60 00 07 00 00 00 | Key 1, 2 and 3 pressed |
|              |            |        | 43 00 60 00 0F 00 00 00 | All keys pressed       |

- **PKU 2400**

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 00h                   | CAN Object 6000h     |
| Byte 2     | 60h                   |                      |
| Byte 3     | 00h                   | Sub index            |
| Byte 4,7   | 00h                   | Not used             |

Examples:

| Direction    | Identifier | Format | Message                 | Data                |
|--------------|------------|--------|-------------------------|---------------------|
| To Keypad    | 615        | Std    | 40 00 60 00 00 00 00 00 |                     |
| Keypad reply | 595        | std    | 43 00 60 00 00 00 00 00 | No key pressed      |
|              |            |        | 43 00 60 00 01 00 00 00 | Key 1 pressed       |
|              |            |        | 43 00 60 00 02 00 00 00 | Key 2 pressed       |
|              |            |        | 43 00 60 00 04 00 00 00 | Key 3 pressed       |
|              |            |        | 43 00 60 00 08 00 00 00 | Key 4 pressed       |
|              |            |        | 43 00 60 00 10 00 00 00 | Key 5 pressed       |
|              |            |        | 43 00 60 00 20 00 00 00 | Key 6 pressed       |
|              |            |        | 43 00 60 00 40 00 00 00 | Key 7 pressed       |
|              |            |        | 43 00 60 00 80 00 00 00 | Key 8 pressed       |
|              |            |        | 43 00 60 00 03 00 00 00 | Key 1 and 2 pressed |
|              |            |        | 43 00 60 00 81 00 00 00 | Key 1 and 8 pressed |
|              |            |        | 43 00 60 00 FF 00 00 00 | All keys pressed    |

## 15. Object 6001h: Digital output module.

This module sets and reads the LED Outputs States. A one indicates the LED is on a zero indicates the LED is off.

### a) Set LED ON

- **PKU 2200**

|            |                       |                          |
|------------|-----------------------|--------------------------|
| Identifier | 600h + current CAN ID | Default 615h             |
| Byte 0     | 23h                   | Set Device Register      |
| Byte 1     | 01h                   | CAN Object 6001h         |
| Byte 2     | 60h                   |                          |
| Byte 3     | 00h                   |                          |
| Byte 4     | XYh                   | X: G4 G3 G2 G1 Green LED |
|            |                       | Y: R4 R3 R2 R1 Red LED   |
| Byte 5     | 0Zh                   | Z: B4 B3 B2 B1 Blue LED  |
| Byte 6,7   | 00h                   | Not used                 |

Examples:

| Direction    | Identifier | Format | Message                 | Data                |
|--------------|------------|--------|-------------------------|---------------------|
| To Keypad    | 615        | Std    | 23 01 60 00 00 00 00 00 | Set all LED off     |
| Keypad Reply | 595        | Std    | 60 01 60 00 00 00 00 00 |                     |
| To Keypad    | 615        | Std    | 23 01 60 00 80 00 00 00 | Set green LED #4 on |
| Keypad Reply | 595        | Std    | 60 01 60 00 00 00 00 00 |                     |
| To Keypad    | 615        | Std    | 23 01 60 00 04 00 00 00 | Set red LED #3 on   |
| Keypad Reply | 595        | Std    | 60 01 60 00 00 00 00 00 |                     |

- **PKU 2400**

|            |                       |                                   |
|------------|-----------------------|-----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                      |
| Byte 0     | 23h                   | Set Device Register               |
| Byte 1     | 01h                   | CAN Object 6001h                  |
| Byte 2     | 60h                   |                                   |
| Byte 3     | 00h                   |                                   |
| Byte 4     | XXh                   | R8 R7 R6 R5 R4 R3 R2 R1 Red LED   |
| Byte 5     | YYh                   | G8 G7 G6 G5 G4 G3 G2 G1 Green LED |
| Byte 6     | ZZh                   | B8 B7 B6 B5 B4 B3 B2 B1 Blue LED  |
| Byte 7     | 00h                   | Not used                          |

Examples:

| Direction    | Identifier | Format | Message                 | Data                |
|--------------|------------|--------|-------------------------|---------------------|
| To Keypad    | 615        | Std    | 23 01 60 00 00 00 00 00 | Set all LED off     |
| Keypad Reply | 595        | Std    | 60 01 60 00 00 00 00 00 |                     |
| To Keypad    | 615        | Std    | 23 01 60 00 00 01 00 00 | Set green LED #1 on |
| Keypad Reply | 595        | Std    | 60 01 60 00 00 00 00 00 |                     |

## b) Read LED ON

The LEDs have the same mapping of Set LED ON message

- **PKU2200**

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 01h                   | CAN Object 6001h     |
| Byte 2     | 60h                   |                      |
| Byte 3     | 00h                   | Sub index            |
| Byte 4,7   | 00h                   | Not Used             |

Examples:

| Direction    | Identifier | Format | Message                 | Data             |
|--------------|------------|--------|-------------------------|------------------|
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 0F 00 00 00 | All red LED on   |
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 08 00 00 00 | Red LED #4 on    |
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 20 00 00 00 | Green LED #2 on  |
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 F0 00 00 00 | All green LED on |
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 00 0F 00 00 | All blue LED on  |

- **PKU 2400**

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 01h                   | CAN Object 6001h     |
| Byte 2     | 60h                   |                      |
| Byte 3     | 00h                   | Sub index            |
| Byte 4,7   | 00h                   | Not Used             |

Examples:

| Direction    | Identifier | Format | Message                 | Data             |
|--------------|------------|--------|-------------------------|------------------|
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 FF 00 00 00 | All red LED on   |
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 01 00 00 00 | Red LED #1 on    |
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 02 00 00 00 | Red LED #2 on    |
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 00 FF 00 00 | All green LED on |
| To Keypad    | 615        | Std    | 40 01 60 00 00 00 00 00 |                  |
| Keypad Reply | 595        | Std    | 43 01 60 00 00 00 FF 00 | All blue LED on  |

## 16. Object 6002h: Digital output module.

This module sets and reads the LED Blink States.

Each bit position represents the corresponding LED. A one indicates the LED is Blinking a zero indicates the LED is Normal. If the Blink Bit is active with the ON Bit Active the LED will Blink Inverse to Normal Operation (ALT blink).

### a) Set LED blink

- **PKU 2200**

|            |                       |                          |
|------------|-----------------------|--------------------------|
| Identifier | 600h + current CAN ID | Default 615h             |
| Byte 0     | 23h                   | Set Device Register      |
| Byte 1     | 02h                   | CAN Object 6002h         |
| Byte 2     | 60h                   |                          |
| Byte 3     | 00h                   |                          |
| Byte 4     | XYh                   | X: G4 G3 G2 G1 Green LED |
|            |                       | Y: R4 R3 R2 R1 Red LED   |
| Byte 5     | 0Zh                   | Z: B4 B3 B2 B1 Blue LED  |
| Byte 6,7   | 00h                   | Not used                 |

Examples:

| Direction    | Identifier | Format | Message                 | Data                     |
|--------------|------------|--------|-------------------------|--------------------------|
| To Keypad    | 615        | Std    | 23 02 60 00 00 00 00 00 | No LED blinks            |
| Keypad Reply | 595        | Std    | 60 02 60 00 00 00 00 00 |                          |
| To Keypad    | 615        | Std    | 23 02 60 00 08 00 00 00 | Only red LED #4 blinks   |
| Keypad Reply | 595        | Std    | 60 02 60 00 00 00 00 00 |                          |
| To Keypad    | 615        | Std    | 23 02 60 00 10 00 00 00 | Only green LED #1 blinks |
| Keypad Reply | 595        | Std    | 60 02 60 00 00 00 00 00 |                          |

- **PKU 2400**

|            |                       |                                   |
|------------|-----------------------|-----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                      |
| Byte 0     | 23h                   | Set Device Register               |
| Byte 1     | 02h                   | CAN Object 6002h                  |
| Byte 2     | 60h                   |                                   |
| Byte 3     | 00h                   |                                   |
| Byte 4     | XXh                   | R8 R7 R6 R5 R4 R3 R2 R1 Red LED   |
| Byte 5     | YYh                   | G8 G7 G6 G5 G4 G3 G2 G1 Green LED |
| Byte 6     | ZZh                   | B8 B7 B6 B5 B4 B3 B2 B1 Blue LED  |
| Byte 7     | 00h                   | Not used                          |

Examples:

| Direction    | Identifier | Format | Message                 | Data   |
|--------------|------------|--------|-------------------------|--|
| To Keypad    | 615        | Std    | 23 02 60 00 00 00 00 00 | No LED blinks                                      |
| Keypad Reply | 595        | Std    | 60 02 60 00 00 00 00 00 |  |
| To Keypad    | 615        | Std    | 23 02 60 00 01 00 00 00 | Only red LED #1 blinks                             |
| Keypad Reply | 595        | Std    | 60 02 60 00 00 00 00 00 |  |
| To Keypad    | 615        | Std    | 23 02 60 00 00 FF 00 00 | All green LED blink, red and blue LED do not blink |
| Keypad Reply | 595        | Std    | 60 02 60 00 00 00 00 00 |  |

## b) Read LED blink

- **PKU 2200**

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 02h                   | CAN Object 6002h     |
| Byte 2     | 60h                   |                      |
| Byte 3     | 00h                   | Sub index            |
| Byte 4,7   | 00h                   | Not Used             |

Examples:

| Direction    | Identifier | Format | Message                 | Data                                |
|--------------|------------|--------|-------------------------|-------------------------------------|
| To Keypad    | 615        | Std    | 40 02 60 00 00 00 00 00 |                                     |
| Keypad Reply | 595        | Std    | 43 02 60 00 FF 0F 00 00 | All LED blink                       |
| To Keypad    | 615        | Std    | 40 02 60 00 00 00 00 00 |                                     |
| Keypad Reply | 595        | Std    | 43 02 60 00 81 00 00 00 | Red LED #1and<br>green LED #4 blink |
| To Keypad    | 615        | Std    | 40 02 60 00 00 00 00 00 |                                     |
| Keypad Reply | 595        | Std    | 43 02 60 00 08 00 00 00 | Red LED #4 blink                    |

- **PKU 2400**

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 02h                   | CAN Object 6002h     |
| Byte 2     | 60h                   |                      |
| Byte 3     | 00h                   | Sub index            |
| Byte 4,7   | 00h                   | Not Used             |

Examples:

| Direction    | Identifier | Format | Message                 | Data                    |
|--------------|------------|--------|-------------------------|-------------------------|
| To Keypad    | 615        | Std    | 40 02 60 00 00 00 00 00 |                         |
| Keypad Reply | 595        | Std    | 43 02 60 00 FF 00 00 00 | Only red LED blink      |
| To Keypad    | 615        | Std    | 40 02 60 00 00 00 00 00 |                         |
| Keypad Reply | 595        | Std    | 43 02 60 00 00 FF 00 00 | Only green LED<br>blink |
| To Keypad    | 615        | Std    | 40 02 60 00 00 00 00 00 |                         |
| Keypad Reply | 595        | Std    | 43 02 60 00 00 01 00 00 | Green LED #1 blink      |

## 17. Object 1017h: Producer heartbeat time

The producer heartbeat time shall indicate the configured cycle time of the heartbeat.

|            |                       |                                     |
|------------|-----------------------|-------------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                        |
| Byte 0     | 40h                   | Read Device Register                |
|            | 2Bh                   | Set device register                 |
| Byte 1     | 17h                   | CAN Object 1017h                    |
| Byte 2     | 10h                   |                                     |
| Byte 3     | 00h                   | Sub index                           |
| Byte 4     | YYh                   | YYh: Heartbeat time in milliseconds |
| Byte 5     | XXh                   | XXh: Heartbeat time in milliseconds |
| Byte 5, 7  | 00h                   | Not used                            |

Heartbeat time: XYYh minimum 000Ah maximum FFFFh milliseconds.

Examples:

| Direction    | Identifier | Format | Message                 | Data                       |
|--------------|------------|--------|-------------------------|----------------------------|
| To Keypad    | 615        | Std    | 40 17 10 00 00 00 00 00 | Read heartbeat time        |
| Keypad Reply | 595        | Std    | 4B 17 10 00 64 00 00 00 | Heartbeat time = 100ms     |
| To Keypad    | 615        | Std    | 2B 17 10 00 00 00 00 00 | Switch off the heartbeat   |
| Keypad Reply | 595        | Std    | 60 17 10 00 00 00 00 00 |                            |
| To Keypad    | 615        | Std    | 2B 17 10 00 32 00 00 00 | Set heartbeat time = 50ms  |
| Keypad Reply | 595        | Std    | 60 17 10 00 00 00 00 00 |                            |
| To Keypad    | 615        | Std    | 2B 17 10 00 F4 01 00 00 | Set heartbeat time = 500ms |
| Keypad Reply | 595        | Std    | 60 17 10 00 00 00 00 00 |                            |

## 18. Object 1000h: Device Type

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 00h                   | CAN Object 1000h     |
| Byte 2     | 10h                   |                      |
| Byte 3, 7  | 00h                   | Not used             |

Example:

| Direction    | Identifier | Format | Data                    |
|--------------|------------|--------|-------------------------|
| To Keypad    | 615        | Std    | 40 00 10 00 00 00 00 00 |
| Keypad Reply | 595        | Std    | 43 00 10 00 91 01 03 00 |

Device profile number 30191h.

## 19. Object 1008h: Manufacturer Device Name

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 08h                   | CAN Object 1008h     |
| Byte 2     | 10h                   |                      |
| Byte 3, 7  | 00h                   | Non used             |

### 1° additional byte

|            |                       |                                |
|------------|-----------------------|--------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                   |
| Byte 0     | 60h                   | Read Device Register Next Byte |
| Byte 1, 7  | 00h                   | Not used                       |

### 2° additional byte

|            |                       |                                |
|------------|-----------------------|--------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                   |
| Byte 0     | 70h                   | Read Device Register Next Byte |
| Byte 1, 7  | 00h                   | Not used                       |

### Example:

| Direction    | Identifier | Format | Message                 | Data    |
|--------------|------------|--------|-------------------------|---------|
| To Keypad    | 615        | Std    | 40 08 10 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 41 08 10 00 0B 00 00 00 |         |
| To Keypad    | 615        | Std    | 60 00 00 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 00 42 6C 69 6E 6B 4D 61 | BlinkMa |
| To Keypad    | 615        | Std    | 70 00 00 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 17 72 69 6E 65 00 00 00 | rine    |

Manufacturer Device Name: BlinkMarine

The first byte of the last data message replied is 17h.

## 20. Object 1009h: Manufacturer Hardware Revision

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 09h                   | CAN Object 1009h     |
| Byte 2     | 10h                   |                      |
| Byte 3, 7  | 00h                   | Not used             |

### 1° additional byte

|            |                       |                                  |
|------------|-----------------------|----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                     |
| Byte 0     | 60h                   | Read Device Register second byte |
| Byte 1, 7  | 00h                   | Not used                         |

### 2° additional byte

|            |                       |                                 |
|------------|-----------------------|---------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                    |
| Byte 0     | 70h                   | Read Device Register third byte |
| Byte 1, 7  | 00h                   | Not used                        |

### Example:

| Direction    | Identifier | Format | Message                 | Data    |
|--------------|------------|--------|-------------------------|---------|
| To Keypad    | 615        | Std    | 40 09 10 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 41 09 10 00 0A 00 00 00 |         |
| To Keypad    | 615        | Std    | 60 00 00 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 00 52 65 76 20 31 2E 30 | Rev 1.0 |
| To Keypad    | 615        | Std    | 70 00 00 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 19 00 44 00 00 00 00 00 | D       |

Manufacturer Hardware Revision: Rev 1.0D

The first byte of the last data message replied is 19h.



## 21. Object 100Ah: Manufacturer Firmware Revision

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 0Ah                   | CAN Object 100Ah     |
| Byte 2     | 10h                   |                      |
| Byte 3, 7  | 00h                   | Not used             |

1° additional byte

|            |                       |                                  |
|------------|-----------------------|----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                     |
| Byte 0     | 60h                   | Read Device Register second byte |
| Byte 1, 7  | 00h                   | Not used                         |

2° additional byte

|            |                       |                                 |
|------------|-----------------------|---------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                    |
| Byte 0     | 70h                   | Read Device Register third byte |
| Byte 1, 7  | 00h                   | Not used                        |

Example:

| Direction    | Identifier | Format | Message                 | Data    |
|--------------|------------|--------|-------------------------|---------|
| To Keypad    | 615        | Std    | 40 0A 10 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 41 0A 10 00 0A 00 00 00 |         |
| To Keypad    | 615        | Std    | 60 00 00 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 00 52 65 76 20 31 2E 30 | Rev 1.0 |
| To Keypad    | 615        | Std    | 70 00 00 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 19 00 52 00 00 00 00 00 | R       |

Manufacturer Firmware Revision: Rev 1.0R.

The first byte of the last data message replied is 19h.

## 22. Object 100Bh: Model ID

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 0Bh                   | CAN Object 100Bh     |
| Byte 2     | 10h                   |                      |
| Byte 3, 7  | 00h                   | Not used             |

1° additional byte

|            |                       |                                  |
|------------|-----------------------|----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                     |
| Byte 0     | 60h                   | Read Device Register second byte |
| Byte 1, 7  | 00h                   | Not used                         |

2° additional byte

|            |                       |                                 |
|------------|-----------------------|---------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                    |
| Byte 0     | 70h                   | Read Device Register third byte |
| Byte 1, 7  | 00h                   | Not used                        |

Example:

| Direction    | Identifier | Format | Message                 | Data    |
|--------------|------------|--------|-------------------------|---------|
| To Keypad    | 615        | Std    | 40 0B 10 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 41 0B 10 00 07 00 00 00 |         |
| To Keypad    | 615        | Std    | 60 00 00 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 00 50 4B 50 32 34 30 30 | PKU2400 |
| To Keypad    | 615        | Std    | 70 00 00 00 00 00 00 00 |         |
| Keypad Reply | 595        | Std    | 1D 00 00 00 00 00 00 00 |         |

Model ID: PKU2400

## 23. Object 1018h: Identity Data

### a. Number of mapped objects

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 18h                   | CAN Object 1018h     |
| Byte 2     | 10h                   |                      |
| Byte 3     | 00h                   | Sub index            |
| Byte 4,7   | 00h                   | Not used             |

Example:

| Direction    | Identifier | Format | Message                 | Data |
|--------------|------------|--------|-------------------------|------|
| To Keypad    | 615        | Std    | 40 18 10 00 00 00 00 00 |      |
| Keypad Reply | 595        | Std    | 4F 18 10 00 04 00 00 00 | 4    |

Number of mapped objects: 4

### b. Vendor ID

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 18h                   | CAN Object 1018h     |
| Byte 2     | 10h                   |                      |
| Byte 3     | 01h                   | Sub index            |
| Byte 4,7   | 00h                   | Not used             |

Example:

| Direction    | Identifier | Format | Message                 | Data     |
|--------------|------------|--------|-------------------------|----------|
| To Keypad    | 615        | Std    | 40 18 10 01 00 00 00 00 |          |
| Keypad Reply | 595        | Std    | 43 18 10 01 5A 03 00 00 | 000035Ah |

Vendor Id: 000035Ah

### c. Product code

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 18h                   | CAN Object 1018h     |
| Byte 2     | 10h                   |                      |
| Byte 3     | 02h                   | Sub index            |
| Byte 4,7   | 00h                   | Not used             |

Example:

| Direction    | Identifier | Format | Message                 | Data |
|--------------|------------|--------|-------------------------|------|
| To Keypad    | 615        | Std    | 40 18 10 02 00 00 00 00 |      |
| Keypad Reply | 595        | Std    | 43 18 10 02 00 00 00 00 | 00h  |

Product code: 0h

d. Revision Number

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 18h                   | CAN Object 1018h     |
| Byte 2     | 10h                   |                      |
| Byte 3     | 03h                   | Sub index            |
| Byte 4,7   | 00h                   | Not used             |

Example:

| Direction    | Identifier | Format | Message                 | Data  |
|--------------|------------|--------|-------------------------|---|
| To Keypad    | 615        | Std    | 40 18 10 03 00 00 00 00 |   |
| Keypad Reply | 595        | Std    | 43 18 10 03 10 16 12 00 | 00 10 15 10<br>Byte 0 App Revision<br>Byte 1 Com Lib Rev<br>Byte 2 HW Lib Rev |

Revision Number: App revision 10h, Com lib revision 16h, HW lib revision 12h.

e. Firmware checksum

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 18h                   | CAN Object 1018h     |
| Byte 2     | 18h                   |                      |
| Byte 3     | 04h                   | Sub index            |
| Byte 4,7   | 00h                   | Not used             |

Example:

| Direction    | Identifier | Format | Message                 | Data         |
|--------------|------------|--------|-------------------------|--------------|
| To Keypad    | 615        | Std    | 40 18 10 04 00 00 00 00 |              |
| Keypad Reply | 595        | Std    | 43 18 10 04 DE E5 2C 00 | 00 2C E5 DEh |

Firmware checksum: 00 2C E5 DEh

## 24. Object 1400h: Receive PDO Communication Parm 0

Describes the Receive Parameters for the LED States PDO Message.

|            |                       |                               |
|------------|-----------------------|-------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                  |
| Byte 0     | 40h                   | Read Device Register          |
| Byte 1     | 00h                   | CAN Object 1400h              |
| Byte 2     | 14h                   |                               |
| Byte 3     | XXh                   | 00h: Number of mapped objects |
|            |                       | 01h: COB Id                   |
|            |                       | 03h: Inhibit Time             |
| Byte 4,7   | 00h                   | Not used                      |

Example:

| Direction    | Identifier | Format | Message                 | Data       |
|--------------|------------|--------|-------------------------|------------|
| To Keypad    | 615        | Std    | 40 00 14 00 00 00 00 00 |            |
| Keypad Reply | 595        | Std    | 4F 00 14 00 02 00 00 00 | 2          |
| To Keypad    | 615        | Std    | 40 00 14 01 00 00 00 00 |            |
| Keypad Reply | 595        | Std    | 4B 00 14 01 00 02 00 00 | 0000 0200h |
| To Keypad    | 615        | Std    | 40 00 14 03 00 00 00 00 |            |
| Keypad Reply | 595        | Std    | 4B 00 14 03 00 00 00 00 | 0000 0000h |

Receive PDO communication Parm 0:

Number of mapped objects:2,  
COB id: 0000 0200h,  
Inhibit Time: 0000 0000h

## 25. Object 1401h: Receive PDO communication Parm 1

Describes the Receive Parameters for the LED Blink States PDO Message.

|            |                       |                               |
|------------|-----------------------|-------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                  |
| Byte 0     | 40h                   | Read Device Register          |
| Byte 1     | 01h                   | CAN Object 1401h              |
| Byte 2     | 14h                   |                               |
| Byte 3     | XXh                   | 00h: Number of mapped objects |
|            |                       | 01h: COB Id                   |
|            |                       | 03h: Inhibit Time             |
| Byte 4,7   | 00h                   | Not used                      |

Example:

| Direction    | Identifier | Format | Message                 | Data       |
|--------------|------------|--------|-------------------------|------------|
| To Keypad    | 615        | Std    | 40 01 14 00 00 00 00 00 |            |
| Keypad Reply | 595        | Std    | 4F 01 14 00 02 00 00 00 | 2          |
| To Keypad    | 615        | Std    | 40 01 14 01 00 00 00 00 |            |
| Keypad Reply | 595        | Std    | 4B 01 14 01 00 03 00 00 | 0000 0300h |
| To Keypad    | 615        | Std    | 40 01 14 03 00 00 00 00 |            |
| Keypad Reply | 595        | Std    | 4B 01 14 03 00 00 00 00 | 0000 0000h |

Receive PDO communication Parm 1:

Number of mapped objects:2,  
COB id: 0000 0300h,  
Inhibit Time: 0000 0000h

## 26. Object 1600h: Output Descriptions

Received asynchronously digital outputs mapping

|            |                       |                               |
|------------|-----------------------|-------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                  |
| Byte 0     | 40h                   | Read Device Register          |
| Byte 1     | 00h                   | CAN Object 1600h              |
| Byte 2     | 16h                   |                               |
| Byte 3     | XXh                   | 00h: Number of mapped objects |
|            |                       | 01h: Set LED outputs          |
|            |                       | 02h: Set LED blink            |
| Byte 4,7   | 00h                   | Not used                      |

Example:

| Direction    | Identifier | Format | Message                 | Data        |
|--------------|------------|--------|-------------------------|-------------|
| To Keypad    | 615        | Std    | 40 00 16 00 00 00 00 00 |             |
| Keypad Reply | 595        | Std    | 4F 00 16 00 02 00 00 00 | 2           |
| To Keypad    | 615        | Std    | 40 00 16 01 00 00 00 00 |             |
| Keypad Reply | 595        | Std    | 43 00 16 01 20 00 01 60 | 6001 00 20h |
| To Keypad    | 615        | Std    | 40 00 16 02 00 00 00 00 |             |
| Keypad Reply | 595        | Std    | 43 00 16 02 20 00 02 60 | 6002 00 20h |

Output descriptions:      Number of mapped objects:2,  
                                 Sets LED output: Object 6001h, Sub index 00h, Length 20h;  
                                 Sets LED blink: Object 6002h, Sub index 00h, Length 20h.



## 29. Object 6100h: Device firmware specific

This Object reads the Device Firmware specifications. This includes the stored serial Number and the device generic model identification.

|            |                       |   |
|------------|-----------------------|---|
| Identifier | 600h + current CAN ID | Default 615h                              |
| Byte 0     | 40h                   | Read Device Register                      |
| Byte 1     | 00h                   | CAN Object 6100h                          |
| Byte 2     | 61h                   |   |
| Byte 3     | XXh                   | 00h: Number of mapped objects             |
|            |                       | 01h: Serial number                        |
|            |                       | 02h: Device model ID (2 additional bytes) |
| Byte 4,7   | 00h                   | Not used                                  |

Examples:

| Direction    | Identifier | Format | Message                 | Data         |
|--------------|------------|--------|-------------------------|--------------|
| To Keypad    | 615        | Std    | 40 00 61 00 00 00 00 00 |              |
| Keypad Reply | 595        | Std    | 4F 00 61 00 02 00 00 00 | 2            |
| To Keypad    | 615        | Std    | 40 00 61 01 00 00 00 00 |              |
| Keypad Reply | 595        | Std    | 43 00 61 01 00 00 00 00 | 00 00 00 00h |
| To Keypad    | 615        | Std    | 40 00 61 02 00 00 00 00 |              |
| Keypad Reply | 595        | Std    | 40 00 61 02 08 00 00 00 |              |
| To Keypad    | 615        | Std    | 60 00 00 00 00 00 00 00 |              |
| Keypad Reply | 595        | Std    | 00 50 4B 55 32 34 30 30 | PKU2400      |
| To Keypad    | 615        | Std    | 70 00 00 00 00 00 00 00 |              |
| Keypad Reply | 595        | Std    | 1D 00 00 00 00 00 00 00 |              |

Number of mapped objects:2, serial number: 00000000h, Model ID: PKU2400

Sub Index 02h needs 2 additional byte

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 00h                   | CAN Object 6100h     |
|            |                       |                      |
| Byte 3     | 02h                   | Device model ID      |
| Byte 4,7   | 00h                   | Not used             |

1° additional byte

|            |                       |                                  |
|------------|-----------------------|----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                     |
| Byte 0     | 60h                   | Read Device Register second byte |
| Byte 1, 7  | 00h                   | Not used                         |

2° additional byte

|            |                       |                                 |
|------------|-----------------------|---------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                    |
| Byte 0     | 70h                   | Read Device Register third byte |
| Byte 1, 7  | 00h                   | Not used                        |

### 30. Object 6201: Device brightness control

This Object Sets/Reads the Device the Brightness levels of both the Key LEDs and the Back light Level.

#### a) Read brightness level

|            |                       |                                  |
|------------|-----------------------|----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                     |
| Byte 0     | 40h                   | Read Device Register             |
| Byte 1     | 01h                   | CAN Object 6201h                 |
| Byte 2     | 62h                   |                                  |
| Byte 3     | XXh                   | 00h: Number of mapped objects    |
|            |                       | 01h: Key LED brightness level    |
|            |                       | 02h: Back light brightness level |
| Byte 4,7   | 00h                   | Not used                         |

Example:

| Direction    | Identifier | Format | Message                 | Data          |
|--------------|------------|--------|-------------------------|---------------|
| To Keypad    | 615        | Std    | 40 01 62 01 00 00 00 00 |               |
| Keypad Reply | 595        | Std    | 4F 01 62 01 3F 00 00 00 | 3Fh (default) |
| To Keypad    | 615        | Std    | 40 01 62 02 00 00 00 00 |               |
| Keypad Reply | 595        | Std    | 4F 01 62 02 00 00 00 00 | 0h (default)  |

#### b) Set brightness level

See also section 11b and 11c.

|            |                       |                                  |
|------------|-----------------------|----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                     |
| Byte 0     | 2Fh                   | Set Device Register              |
| Byte 1     | 01h                   | CAN Object 6201h                 |
| Byte 2     | 62h                   |                                  |
| Byte 3     | XXh                   | 01h: Key LED brightness level    |
|            |                       | 02h: Back light brightness level |
| Byte 4     | 00 – 3Fh              | 0-100%                           |
| Byte 5,7   | 00h                   | Not used                         |

Example:

| Direction    | Identifier | Format | Message                 | Data                  |
|--------------|------------|--------|-------------------------|-----------------------|
| To Keypad    | 615        | Std    | 2F 01 62 01 20 00 00 00 | Set key LED value=20h |
| Keypad Reply | 595        | Std    | 60 01 62 01 00 00 00 00 |                       |
| To Keypad    | 615        | Std    | 2F 01 62 02 31 00 00 00 | Set backlight 31h     |
| Keypad Reply | 595        | Std    | 60 01 62 02 00 00 00 00 |                       |



## 31. Object 6300h: Serial number string

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 00h                   | CAN Object 6300h     |
| Byte 2     | 63h                   |                      |
| Byte 3,7   | 00h                   | Not used             |

1° additional byte

|            |                       |                                  |
|------------|-----------------------|----------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                     |
| Byte 0     | 60h                   | Read Device Register second byte |
| Byte 1, 7  | 00h                   | Not used                         |

2° additional byte

|            |                       |                                 |
|------------|-----------------------|---------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                    |
| Byte 0     | 70h                   | Read Device Register third byte |
| Byte 1, 7  | 00h                   | Not used                        |

Example:

| Direction    | Identifier | Format | Message                 | Data   |
|--------------|------------|--------|-------------------------|--------|
| To Keypad    | 615        | Std    | 41 00 63 00 00 00 00 00 |        |
| Keypad Reply | 595        | Std    | 41 00 63 00 06 00 00 00 |        |
| To Keypad    | 615        | Std    | 60 00 00 00 00 00 00 00 |        |
| Keypad Reply | 595        | Std    | 00 30 30 30 30 30 30 00 | 000000 |
| To Keypad    | 615        | Std    | 70 00 00 00 00 00 00 00 |        |
| Keypad Reply | 595        | Std    | 1D 00 00 00 00 00 00 00 |        |

Serial number: ascii 000000.

## 32. Object 6301h: Bootloader presence

|            |                       |                      |
|------------|-----------------------|----------------------|
| Identifier | 600h + current CAN ID | Default 615h         |
| Byte 0     | 40h                   | Read Device Register |
| Byte 1     | 01h                   | CAN Object 6301h     |
| Byte 2     | 63h                   |                      |
| Byte 3,7   | 00h                   | Not used             |

Example:

| Direction    | Identifier | Format | Message                 | Data                   |
|--------------|------------|--------|-------------------------|------------------------|
| To Keypad    | 615        | Std    | 40 01 63 00 00 00 00 00 |                        |
| Keypad Reply | 595        | Std    | 4F 01 63 00 00 00 00 00 | Bootloader not present |
| To Keypad    | 615        | Std    | 40 01 63 00 00 00 00 00 |                        |
| Keypad Reply | 595        | Std    | 4F 01 63 00 01 00 00 00 | Bootloader present     |

### 33. Object 6302h: Device key and LED count

|            |                       |                              |
|------------|-----------------------|------------------------------|
| Identifier | 600h + current CAN ID | Default 615h                 |
| Byte 0     | 40h                   | Read Device Register         |
| Byte 1     | 02h                   | CAN Object 6302h             |
| Byte 2     | 63h                   |                              |
| Byte 3     | XXh                   | 00h: Number of objects       |
|            |                       | 01h: Total number of Keys    |
|            |                       | 02h: Number of external Keys |
|            |                       | 03h: Total number of LED     |
| Byte 4,7   | 00h                   | 04h: Number of external LED  |
|            |                       | Not used                     |

Example:

| Direction    | Identifier | Format | Message                 | Data |
|--------------|------------|--------|-------------------------|------|
| To Keypad    | 615        | Std    | 40 02 63 00 00 00 00 00 |      |
| Keypad Reply | 595        | Std    | 4F 02 63 00 02 00 00 00 | 2    |
| To Keypad    | 615        | Std    | 40 02 63 01 00 00 00 00 |      |
| Keypad Reply | 595        | Std    | 4F 02 63 01 0F 00 00 00 | 0Fh  |
| To Keypad    | 615        | Std    | 40 02 63 02 00 00 00 00 |      |
| Keypad Reply | 595        | Std    | 4F 02 63 02 03 00 00 00 | 3h   |
| To Keypad    | 615        | Std    | 40 02 63 03 00 00 00 00 |      |
| Keypad Reply | 595        | Std    | 4F 02 63 03 1E 00 00 00 | 1Eh  |
| To Keypad    | 615        | Std    | 40 02 63 04 00 00 00 00 |      |
| Keypad Reply | 595        | Std    | 4F 02 63 04 06 00 00 00 | 06h  |

PKU2400 key and LED count:   Number of objects: 2; Total number of keys: 11;  
   Number of external keys: 3; Number of LED: 30;  
   Number of external LED: 6.