

SER5

serial interfaces through software with internal Timer

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SER5 - Serial interfaces through software with internal Timer

This device driver enables up to two asynchronous serial inputs and outputs on internal I/O-pins. The interface has been implemented purely in the software. When installing the driver the file name determines at which pins the serial input and output takes place. The baud rate is determined by an internal timer, so **TIMERA is not used for these drivers**.

The driver can be set to individual requirements:

- RxD + TxD: activate/deactivate individual channels.
- RxD + TxD: each with 256, 1024 or 4096 byte FiFo buffer.
- RxD + TxD: with flow control: RTS / CTS activate/deactivate.
- TxD: RS-485 bus access control TE activate/deactivate.
- Data-Bits: Data format: 1...8 Bits.
- Parity-Bit: No, Even, Odd, Mark, Space.
- Baud rates: quasi-infinitely variable baud rates
- Level: TRUE + INVERSE level possible for RS-232 with/without power driver.
- PINs: RxD, TxD, RTS, CTS and TE can be laid to almost any I/O-pin of the Tiger.
- Unused pins of SER5 can be individually used as I/O's or for other device drivers.

Note: SER5_XX.TD2 puts much more strain on the CPU than a driver such as SER1B_xx.TD2 since several System-Task calls are carried out for every single bit. The following should therefore be taken into account when using this driver:

- only use SER5 if sufficient CPU performance is available.
- do not select too high a total baud rate for all RxD and TxD channels:
- The Debug function can be impaired with a higher CPU work-load.

The device driver can only be installed once, but it is possible to install SER5_pp_xx.TD2 and SER5B_pp_xx.TD2 together. With this combination it is possible to use up to 4 extra serial interfaces without TIMERA.

File name: SER5_pp_xx.TD2
SER5B_pp_xx.TD2

INSTALL DEVICE #D, "SER5_pp_xx.TD2", P1,...P9

INSTALL DEVICE #D, "SER5B_pp_xx.TD2", P1,...P9

| | |
|-----------------|---|
| D | is a constant, variable or expression of the data type BYTE, WORD, LONG in the range 0...63 and stands for the device number of the driver. |
| pp | in the file name stands for the position of the first pin (Port,Pin). A table further below in the text shows the location of the pins arising from the selection of the device driver. |
| xx | determines the buffer size: R1 = 256 Bytes, K1 = 1KByte, K4 = 4Kbyte. |
| P1...P10 | the following table shows the meaning of the parameters P1 to P10: |

| | leave unchanged | Description of the parameter |
|----|-----------------|--|
| P1 | 0EEH | is a parameter to determine the number of data bits. Value: 1...8 (Default: 8) |
| P2 | 0EEH | is a parameter to determine the parity: 0 = NO (Default) 1 = SPACE 2 = Even 3 = Odd 4 = MARK |
| P3 | 0EEH | 0 = TRUE (Default) 1 = INVERS |
| P4 | - | Transmitter Pre-Scaler 0 = no Transmitter present 1 = without Prescaler 2...255 = Prescaler Factor (Default: 3) |
| P5 | - | Receive Oversample 0,1,2 = no Receiver present 3...255 = Oversample-Factor (Default: 3) |
| P6 | - | Reserved, always 1. |
| P7 | 0EEH | Hardware-Handshake Pins: lower 3 Bits: 000 = no Handshake-Pins (Default) 001 = CTS-Pin (input, controls send activity) 010 = RTS-Pin (output, shows whether RxD has space in the buffer) 011 = RTS+CTS 100 = Transmitter-Enable f. RS-485 (output, shows whether data in TxD buffer) |
| P8 | 0EEH | Clock select: SER5_pp_xx.TD2: 1: $\Phi T1$ 2: $\Phi T4$ (Default) 3: $\Phi T16$ SER5B_pp_xx.TD2: 1: $\Phi T1$ 2: $\Phi T16$ (Default) 3: $\Phi T256$ |

| | leave unchanged | Description of the parameter |
|-----|-----------------|--|
| P9 | - | Divisor factor: is a parameter to determine the factor by which the basic clock pulse is divided (Default: 173) |
| P10 | 0EEH | Channel select: 0: single channel mode (only first channel is used) 1: multi channel mode (both channels are used) (Default) |

The device driver uses up to eight I/O-pins which can be laid almost at random on the internal I/O pins of the Tiger module. The following table shows which assignments are possible by selecting the suitable driver file:

SER5 - Serial interfaces through software with internal Timer

| Driver name | CTS-0 (in) or TE (out) | RTS-0 (out) | TxD-0 (out) | RxD-0 01 (in) | TxD-1 (out) | RxD-1 (in) | CTS-1 (in) or TE (out) | RTS-1 (out) |
|----------------|---------------------------------|----------------|----------------|------------------|----------------|---------------|---------------------------------|----------------|
| SER5_80_xx.TD2 | L80 | L81 | L82 | L83 | L84 | L85 | L86 | L87 |
| SER5_81_xx.TD2 | L81 | L82 | L83 | L84 | L85 | L86 | L87 | L70 |
| SER5_82_xx.TD2 | L82 | L83 | L84 | L85 | L86 | L87 | L70 | L71 |
| SER5_83_xx.TD2 | L83 | L84 | L85 | L86 | L87 | L70 | L71 | L72 |
| SER5_84_xx.TD2 | L84 | L85 | L86 | L87 | L70 | L71 | L72 | L73 |
| SER5_85_xx.TD2 | L85 | L86 | L87 | L70 | L71 | L72 | L73 | L74 |
| SER5_86_xx.TD2 | L86 | L87 | L70 | L71 | L72 | L73 | L74 | L75 |
| SER5_87_xx.TD2 | L87 | L70 | L71 | L72 | L73 | L74 | L75 | L76 |
| SER5_70_xx.TD2 | L70 | L71 | L72 | L73 | L74 | L75 | L76 | L77 |
| SER5_71_xx.TD2 | L71 | L72 | L73 | L74 | L75 | L76 | L77 | L60 |
| SER5_72_xx.TD2 | L72 | L73 | L74 | L75 | L76 | L77 | L60 | L61 |
| SER5_73_xx.TD2 | L73 | L74 | L75 | L76 | L77 | L60 | L61 | L62 |
| SER5_74_xx.TD2 | L74 | L75 | L76 | L77 | L60 | L61 | L62 | L63 |
| SER5_75_xx.TD2 | L75 | L76 | L77 | L60 | L61 | L62 | L63 | L64 |
| SER5_76_xx.TD2 | L76 | L77 | L60 | L61 | L62 | L63 | L64 | L65 |
| SER5_77_xx.TD2 | L77 | L60 | L61 | L62 | L63 | L64 | L65 | L66 |
| SER5_60_xx.TD2 | L60 | L61 | L62 | L63 | L64 | L65 | L66 | L67 |
| SER5_61_xx.TD2 | L61 | L62 | L63 | L64 | L65 | L66 | L67 | L40 |
| SER5_62_xx.TD2 | L62 | L63 | L64 | L65 | L66 | L67 | L40 | L42 |
| SER5_63_xx.TD2 | L63 | L64 | L65 | L66 | L67 | L40 | L42 | L33 |
| SER5_64_xx.TD2 | L64 | L65 | L66 | L67 | L40 | L42 | L33 | L34 |
| SER5_65_xx.TD2 | L65 | L66 | L67 | L40 | L42 | L33 | L34 | L35 |
| SER5_66_xx.TD2 | L66 | L67 | L40 | L42 | L33 | L34 | L35 | L36 |
| SER5_67_xx.TD2 | L67 | L40 | L42 | L33 | L34 | L35 | L36 | L37 |
| SER5_40_xx.TD2 | L40 | L42 | L33 | L34 | L35 | L36 | L37 | L70 |
| SER5_42_xx.TD2 | L42 | L33 | L34 | L35 | L36 | L37 | L70 | L71 |
| SER5_33_xx.TD2 | L33 | L34 | L35 | L36 | L37 | L70 | L71 | L72 |
| SER5_34_xx.TD2 | L34 | L35 | L36 | L37 | L70 | L71 | L72 | L73 |
| SER5_35_xx.TD2 | L35 | L36 | L37 | L70 | L71 | L72 | L73 | L74 |

SER5 - Serial interfaces through software with internal Timer

| Driver name | CTS-0 (in) or TE (out) | RTS-0 (out) | TxD-0 (out) | RxD-01 (in) | TxD-1 (out) | RxD-1 (in) | CTS-1 (in) or TE (out) | RTS-1 (out) |
|------------------|---------------------------------|----------------|----------------|-------------|----------------|---------------|---------------------------------|----------------|
| SER5_36_xx.TD2 | L36 | L37 | L70 | L71 | L72 | L73 | L74 | L75 |
| SER5_37_xx.TD2 | L37 | L70 | L71 | L72 | L73 | L74 | L75 | L76 |
| SER5_3672_xx.TD2 | L36 | L37 | L72 | L73 | L74 | L75 | L70 | L71 |

Setting the baud rate

According to the driver one of the following source clocks can be selected:

| Clock | Frequency | Interval |
|-------------|--------------|---------------|
| $\Phi T1$ | 2,500,000 Hz | 400 ns |
| $\Phi T4$ | 625,000 Hz | 1.6 μs |
| $\Phi T16$ | 156,250 Hz | 6.4 μs |
| $\Phi T256$ | 9765,625 Hz | 102,4 μs |

Please choose a divisor factor from the following table according to the selected clock:

SER5 - Serial interfaces through software with internal Timer

| Frequ. | Factor |
|-----------|--------|
| $\Phi T1$ | |
| 62.500 | 40 |
| 60.976 | 41 |
| 59.524 | 42 |
| 58.140 | 43 |
| 56.818 | 44 |
| 55.556 | 45 |
| 54.348 | 46 |
| 53.191 | 47 |
| 52.083 | 48 |
| 51.020 | 49 |
| 50.000 | 50 |
| 49.020 | 51 |
| 48.077 | 52 |
| 47.170 | 53 |
| 46.296 | 54 |
| 45.455 | 55 |
| 44.643 | 56 |
| 43.860 | 57 |
| 43.103 | 58 |
| 42.373 | 59 |
| 41.667 | 60 |
| 40.984 | 61 |
| 40.323 | 62 |
| 39.683 | 63 |
| 39.063 | 64 |
| 38.462 | 65 |
| 37.879 | 66 |
| 37.313 | 67 |
| 36.765 | 68 |
| 36.232 | 69 |
| 35.714 | 70 |

| Frequ. | Factor |
|--------|--------|
| 35.211 | 71 |
| 34.722 | 72 |
| 34.247 | 73 |
| 33.784 | 74 |
| 33.333 | 75 |
| 32.895 | 76 |
| 32.468 | 77 |
| 32.051 | 78 |
| 31.646 | 79 |
| 31.250 | 80 |
| 30.864 | 81 |
| 30.488 | 82 |
| 30.120 | 83 |
| 29.762 | 84 |
| 29.412 | 85 |
| 29.070 | 86 |
| 28.736 | 87 |
| 28.409 | 88 |
| 28.090 | 89 |
| 27.778 | 90 |
| 27.473 | 91 |
| 27.174 | 92 |
| 26.882 | 93 |
| 26.596 | 94 |
| 26.316 | 95 |
| 26.042 | 96 |
| 25.773 | 97 |
| 25.510 | 98 |
| 25.253 | 99 |
| 25.000 | 100 |
| 24.752 | 101 |
| 24.510 | 102 |

| Frequ. | Factor |
|--------|--------|
| 24.272 | 103 |
| 24.038 | 104 |
| 23.810 | 105 |
| 23.585 | 106 |
| 23.364 | 107 |
| 23.148 | 108 |
| 22.936 | 109 |
| 22.727 | 110 |
| 22.523 | 111 |
| 22.321 | 112 |
| 22.124 | 113 |
| 21.930 | 114 |
| 21.739 | 115 |
| 21.552 | 116 |
| 21.368 | 117 |
| 21.186 | 118 |
| 21.008 | 119 |
| 20.833 | 120 |
| 20.661 | 121 |
| 20.492 | 122 |
| 20.325 | 123 |
| 20.161 | 124 |
| 20.000 | 125 |
| 19.841 | 126 |
| 19.685 | 127 |
| 19.531 | 128 |
| 19.380 | 129 |
| 19.231 | 130 |
| 19.084 | 131 |
| 18.939 | 132 |
| 18.797 | 133 |
| 18.657 | 134 |

| Frequ. | Factor |
|--------|--------|
| 18.519 | 135 |
| 18.382 | 136 |
| 18.248 | 137 |
| 18.116 | 138 |
| 17.986 | 139 |
| 17.857 | 140 |
| 17.730 | 141 |
| 17.606 | 142 |
| 17.483 | 143 |
| 17.361 | 144 |
| 17.241 | 145 |
| 17.123 | 146 |
| 17.007 | 147 |
| 16.892 | 148 |
| 16.779 | 149 |
| 16.667 | 150 |
| 16.556 | 151 |
| 16.447 | 152 |
| 16.340 | 153 |
| 16.234 | 154 |
| 16.129 | 155 |
| 16.026 | 156 |
| 15.924 | 157 |
| 15.823 | 158 |
| 15.723 | 159 |
| 15.625 | 160 |
| 15.528 | 161 |
| 15.432 | 162 |
| 15.337 | 163 |
| 15.244 | 164 |
| 15.152 | 165 |
| 15.060 | 166 |

SER5 - Serial interfaces through software with internal Timer

| Frequ. | Factor |
|--------|--------|
| 14.970 | 167 |
| 14.881 | 168 |
| 14.793 | 169 |
| 14.706 | 170 |
| 14.620 | 171 |
| 14.535 | 172 |
| 14.451 | 173 |
| 14.368 | 174 |
| 14.286 | 175 |
| 14.205 | 176 |
| 14.124 | 177 |
| 14.045 | 178 |
| 13.966 | 179 |
| 13.889 | 180 |
| 13.812 | 181 |
| 13.736 | 182 |
| 13.661 | 183 |
| 13.587 | 184 |
| 13.514 | 185 |
| 13.441 | 186 |
| 13.369 | 187 |
| 13.298 | 188 |
| 13.228 | 189 |
| 13.158 | 190 |
| 13.089 | 191 |
| 13.021 | 192 |
| 12.953 | 193 |
| 12.887 | 194 |
| 12.821 | 195 |
| 12.755 | 196 |
| 12.690 | 197 |
| 12.626 | 198 |

| Frequ. | Factor |
|--------|--------|
| 12.563 | 199 |
| 12.500 | 200 |
| 12.438 | 201 |
| 12.376 | 202 |
| 12.315 | 203 |
| 12.255 | 204 |
| 12.195 | 205 |
| 12.136 | 206 |
| 12.077 | 207 |
| 12.019 | 208 |
| 11.962 | 209 |
| 11.905 | 210 |
| 11.848 | 211 |
| 11.792 | 212 |
| 11.737 | 213 |
| 11.682 | 214 |
| 11.628 | 215 |
| 11.574 | 216 |
| 11.521 | 217 |
| 11.468 | 218 |
| 11.416 | 219 |
| 11.364 | 220 |
| 11.312 | 221 |
| 11.261 | 222 |
| 11.211 | 223 |
| 11.161 | 224 |
| 11.111 | 225 |
| 11.062 | 226 |
| 11.013 | 227 |
| 10.965 | 228 |
| 10.917 | 229 |
| 10.870 | 230 |

| Frequ. | Factor |
|--------|--------|
| 10.823 | 231 |
| 10.776 | 232 |
| 10.730 | 233 |
| 10.684 | 234 |
| 10.638 | 235 |
| 10.593 | 236 |
| 10.549 | 237 |
| 10.504 | 238 |
| 10.460 | 239 |
| 10.417 | 240 |
| 10.373 | 241 |
| 10.331 | 242 |
| 10.288 | 243 |
| 10.246 | 244 |
| 10.204 | 245 |
| 10.163 | 246 |
| 10.121 | 247 |
| 10.081 | 248 |
| 10.040 | 249 |
| 10.000 | 250 |
| 9.960 | 251 |
| 9.921 | 252 |
| 9.881 | 253 |
| 9.843 | 254 |
| 9.804 | 255 |

| Frequ. | Factor |
|--------|--------|
| ΦT4 | |
| 62.500 | 10 |
| 56.818 | 11 |
| 52.083 | 12 |
| 48.077 | 13 |
| 44.643 | 14 |
| 41.667 | 15 |
| 39.063 | 16 |
| 36.765 | 17 |
| 34.722 | 18 |
| 32.895 | 19 |
| 31.250 | 20 |
| 29.762 | 21 |
| 28.409 | 22 |
| 27.174 | 23 |
| 26.042 | 24 |
| 25.000 | 25 |
| 24.038 | 26 |
| 23.148 | 27 |
| 22.321 | 28 |
| 21.552 | 29 |
| 20.833 | 30 |
| 20.161 | 31 |
| 19.531 | 32 |
| 18.939 | 33 |
| 18.382 | 34 |
| 17.857 | 35 |
| 17.361 | 36 |
| 16.892 | 37 |
| 16.447 | 38 |
| 16.026 | 39 |
| 15.625 | 40 |

SER5 - Serial interfaces through software with internal Timer

| Frequ. | Factor |
|--------|--------|
| 15.244 | 41 |
| 14.881 | 42 |
| 14.535 | 43 |
| 14.205 | 44 |
| 13.889 | 45 |
| 13.587 | 46 |
| 13.298 | 47 |
| 13.021 | 48 |
| 12.755 | 49 |
| 12.500 | 50 |
| 12.255 | 51 |
| 12.019 | 52 |
| 11.792 | 53 |
| 11.574 | 54 |
| 11.364 | 55 |
| 11.161 | 56 |
| 10.965 | 57 |
| 10.776 | 58 |
| 10.593 | 59 |
| 10.417 | 60 |
| 10.246 | 61 |
| 10.081 | 62 |
| 9.921 | 63 |
| 9.766 | 64 |
| 9.615 | 65 |
| 9.470 | 66 |
| 9.328 | 67 |
| 9.191 | 68 |
| 9.058 | 69 |
| 8.929 | 70 |
| 8.803 | 71 |
| 8.681 | 72 |

| Frequ. | Factor |
|--------|--------|
| 8.562 | 73 |
| 8.446 | 74 |
| 8.333 | 75 |
| 8.224 | 76 |
| 8.117 | 77 |
| 8.013 | 78 |
| 7.911 | 79 |
| 7.813 | 80 |
| 7.716 | 81 |
| 7.622 | 82 |
| 7.530 | 83 |
| 7.440 | 84 |
| 7.353 | 85 |
| 7.267 | 86 |
| 7.184 | 87 |
| 7.102 | 88 |
| 7.022 | 89 |
| 6.944 | 90 |
| 6.868 | 91 |
| 6.793 | 92 |
| 6.720 | 93 |
| 6.649 | 94 |
| 6.579 | 95 |
| 6.510 | 96 |
| 6.443 | 97 |
| 6.378 | 98 |
| 6.313 | 99 |
| 6.250 | 100 |
| 6.188 | 101 |
| 6.127 | 102 |
| 6.068 | 103 |
| 6.010 | 104 |

| Frequ. | Factor |
|--------|--------|
| 5.952 | 105 |
| 5.896 | 106 |
| 5.841 | 107 |
| 5.787 | 108 |
| 5.734 | 109 |
| 5.682 | 110 |
| 5.631 | 111 |
| 5.580 | 112 |
| 5.531 | 113 |
| 5.482 | 114 |
| 5.435 | 115 |
| 5.388 | 116 |
| 5.342 | 117 |
| 5.297 | 118 |
| 5.252 | 119 |
| 5.208 | 120 |
| 5.165 | 121 |
| 5.123 | 122 |
| 5.081 | 123 |
| 5.040 | 124 |
| 5.000 | 125 |
| 4.960 | 126 |
| 4.921 | 127 |
| 4.883 | 128 |
| 4.845 | 129 |
| 4.808 | 130 |
| 4.771 | 131 |
| 4.735 | 132 |
| 4.699 | 133 |
| 4.664 | 134 |
| 4.630 | 135 |
| 4.596 | 136 |

| Frequ. | Factor |
|--------|--------|
| 4.562 | 137 |
| 4.529 | 138 |
| 4.496 | 139 |
| 4.464 | 140 |
| 4.433 | 141 |
| 4.401 | 142 |
| 4.371 | 143 |
| 4.340 | 144 |
| 4.310 | 145 |
| 4.281 | 146 |
| 4.252 | 147 |
| 4.223 | 148 |
| 4.195 | 149 |
| 4.167 | 150 |
| 4.139 | 151 |
| 4.112 | 152 |
| 4.085 | 153 |
| 4.058 | 154 |
| 4.032 | 155 |
| 4.006 | 156 |
| 3.981 | 157 |
| 3.956 | 158 |
| 3.931 | 159 |
| 3.906 | 160 |
| 3.882 | 161 |
| 3.858 | 162 |
| 3.834 | 163 |
| 3.811 | 164 |
| 3.788 | 165 |
| 3.765 | 166 |
| 3.743 | 167 |
| 3.720 | 168 |

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| Frequ. | Factor |
|--------|--------|
| 3.698 | 169 |
| 3.676 | 170 |
| 3.655 | 171 |
| 3.634 | 172 |
| 3.613 | 173 |
| 3.592 | 174 |
| 3.571 | 175 |
| 3.551 | 176 |
| 3.531 | 177 |
| 3.511 | 178 |
| 3.492 | 179 |
| 3.472 | 180 |
| 3.453 | 181 |
| 3.434 | 182 |
| 3.415 | 183 |
| 3.397 | 184 |
| 3.378 | 185 |
| 3.360 | 186 |
| 3.342 | 187 |
| 3.324 | 188 |
| 3.307 | 189 |
| 3.289 | 190 |
| 3.272 | 191 |
| 3.255 | 192 |
| 3.238 | 193 |
| 3.222 | 194 |
| 3.205 | 195 |
| 3.189 | 196 |
| 3.173 | 197 |
| 3.157 | 198 |
| 3.141 | 199 |
| 3.125 | 200 |

| Frequ. | Factor |
|--------|--------|
| 3.109 | 201 |
| 3.094 | 202 |
| 3.079 | 203 |
| 3.064 | 204 |
| 3.049 | 205 |
| 3.034 | 206 |
| 3.019 | 207 |
| 3.005 | 208 |
| 2.990 | 209 |
| 2.976 | 210 |
| 2.962 | 211 |
| 2.948 | 212 |
| 2.934 | 213 |
| 2.921 | 214 |
| 2.907 | 215 |
| 2.894 | 216 |
| 2.880 | 217 |
| 2.867 | 218 |
| 2.854 | 219 |
| 2.841 | 220 |
| 2.828 | 221 |
| 2.815 | 222 |
| 2.803 | 223 |
| 2.790 | 224 |
| 2.778 | 225 |
| 2.765 | 226 |
| 2.753 | 227 |
| 2.741 | 228 |
| 2.729 | 229 |
| 2.717 | 230 |
| 2.706 | 231 |
| 2.694 | 232 |

| Frequ. | Factor |
|--------|--------|
| 2.682 | 233 |
| 2.671 | 234 |
| 2.660 | 235 |
| 2.648 | 236 |
| 2.637 | 237 |
| 2.626 | 238 |
| 2.615 | 239 |
| 2.604 | 240 |
| 2.593 | 241 |
| 2.583 | 242 |
| 2.572 | 243 |
| 2.561 | 244 |
| 2.551 | 245 |
| 2.541 | 246 |
| 2.530 | 247 |
| 2.520 | 248 |
| 2.510 | 249 |
| 2.500 | 250 |
| 2.490 | 251 |
| 2.480 | 252 |
| 2.470 | 253 |
| 2.461 | 254 |
| 2.451 | 255 |

| Frequ. | Factor |
|--------|--------|
| ΦT16 | |
| 52.083 | 3 |
| 39.063 | 4 |
| 31.250 | 5 |
| 26.042 | 6 |
| 22.321 | 7 |
| 19.531 | 8 |
| 17.361 | 9 |
| 15.625 | 10 |
| 14.205 | 11 |
| 13.021 | 12 |
| 12.019 | 13 |
| 11.161 | 14 |
| 10.417 | 15 |
| 9.766 | 16 |
| 9.191 | 17 |
| 8.681 | 18 |
| 8.224 | 19 |
| 7.813 | 20 |
| 7.440 | 21 |
| 7.102 | 22 |
| 6.793 | 23 |
| 6.510 | 24 |
| 6.250 | 25 |
| 6.010 | 26 |
| 5.787 | 27 |
| 5.580 | 28 |
| 5.388 | 29 |
| 5.208 | 30 |
| 5.040 | 31 |
| 4.883 | 32 |
| 4.735 | 33 |

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| Frequ. | Factor |
|--------|--------|
| 4.596 | 34 |
| 4.464 | 35 |
| 4.340 | 36 |
| 4.223 | 37 |
| 4.112 | 38 |
| 4.006 | 39 |
| 3.906 | 40 |
| 3.811 | 41 |
| 3.720 | 42 |
| 3.634 | 43 |
| 3.551 | 44 |
| 3.472 | 45 |
| 3.397 | 46 |
| 3.324 | 47 |
| 3.255 | 48 |
| 3.189 | 49 |
| 3.125 | 50 |
| 3.064 | 51 |
| 3.005 | 52 |
| 2.948 | 53 |
| 2.894 | 54 |
| 2.841 | 55 |
| 2.790 | 56 |
| 2.741 | 57 |
| 2.694 | 58 |
| 2.648 | 59 |
| 2.604 | 60 |
| 2.561 | 61 |
| 2.520 | 62 |
| 2.480 | 63 |
| 2.441 | 64 |
| 2.404 | 65 |

| Frequ. | Factor |
|--------|--------|
| 2.367 | 66 |
| 2.332 | 67 |
| 2.298 | 68 |
| 2.264 | 69 |
| 2.232 | 70 |
| 2.201 | 71 |
| 2.170 | 72 |
| 2.140 | 73 |
| 2.111 | 74 |
| 2.083 | 75 |
| 2.056 | 76 |
| 2.029 | 77 |
| 2.003 | 78 |
| 1.978 | 79 |
| 1.953 | 80 |
| 1.929 | 81 |
| 1.905 | 82 |
| 1.883 | 83 |
| 1.860 | 84 |
| 1.838 | 85 |
| 1.817 | 86 |
| 1.796 | 87 |
| 1.776 | 88 |
| 1.756 | 89 |
| 1.736 | 90 |
| 1.717 | 91 |
| 1.698 | 92 |
| 1.680 | 93 |
| 1.662 | 94 |
| 1.645 | 95 |
| 1.628 | 96 |
| 1.611 | 97 |

| Frequ. | Factor |
|--------|--------|
| 1.594 | 98 |
| 1.578 | 99 |
| 1.563 | 100 |
| 1.547 | 101 |
| 1.532 | 102 |
| 1.517 | 103 |
| 1.502 | 104 |
| 1.488 | 105 |
| 1.474 | 106 |
| 1.460 | 107 |
| 1.447 | 108 |
| 1.433 | 109 |
| 1.420 | 110 |
| 1.408 | 111 |
| 1.395 | 112 |
| 1.383 | 113 |
| 1.371 | 114 |
| 1.359 | 115 |
| 1.347 | 116 |
| 1.335 | 117 |
| 1.324 | 118 |
| 1.313 | 119 |
| 1.302 | 120 |
| 1.291 | 121 |
| 1.281 | 122 |
| 1.270 | 123 |
| 1.260 | 124 |
| 1.250 | 125 |
| 1.240 | 126 |
| 1.230 | 127 |
| 1.221 | 128 |
| 1.211 | 129 |

| Frequ. | Factor |
|--------|--------|
| 1.202 | 130 |
| 1.193 | 131 |
| 1.184 | 132 |
| 1.175 | 133 |
| 1.166 | 134 |
| 1.157 | 135 |
| 1.149 | 136 |
| 1.141 | 137 |
| 1.132 | 138 |
| 1.124 | 139 |
| 1.116 | 140 |
| 1.108 | 141 |
| 1.100 | 142 |
| 1.093 | 143 |
| 1.085 | 144 |
| 1.078 | 145 |
| 1.070 | 146 |
| 1.063 | 147 |
| 1.056 | 148 |
| 1.049 | 149 |
| 1.042 | 150 |
| 1.035 | 151 |
| 1.028 | 152 |
| 1.021 | 153 |
| 1.015 | 154 |
| 1.008 | 155 |
| 1.002 | 156 |
| 995 | 157 |
| 989 | 158 |
| 983 | 159 |
| 977 | 160 |
| 970 | 161 |

SER5 - Serial interfaces through software with internal Timer

| Frequ. | Factor |
|--------|--------|
| 965 | 162 |
| 959 | 163 |
| 953 | 164 |
| 947 | 165 |
| 941 | 166 |
| 936 | 167 |
| 930 | 168 |
| 925 | 169 |
| 919 | 170 |
| 914 | 171 |
| 908 | 172 |
| 903 | 173 |
| 898 | 174 |
| 893 | 175 |
| 888 | 176 |
| 883 | 177 |
| 878 | 178 |
| 873 | 179 |
| 868 | 180 |
| 863 | 181 |
| 859 | 182 |
| 854 | 183 |
| 849 | 184 |
| 845 | 185 |
| 840 | 186 |
| 836 | 187 |
| 831 | 188 |
| 827 | 189 |
| 822 | 190 |
| 818 | 191 |
| 814 | 192 |
| 810 | 193 |

| Frequ. | Factor |
|--------|--------|
| 805 | 194 |
| 801 | 195 |
| 797 | 196 |
| 793 | 197 |
| 789 | 198 |
| 785 | 199 |
| 781 | 200 |
| 777 | 201 |
| 774 | 202 |
| 770 | 203 |
| 766 | 204 |
| 762 | 205 |
| 758 | 206 |
| 755 | 207 |
| 751 | 208 |
| 748 | 209 |
| 744 | 210 |
| 741 | 211 |
| 737 | 212 |
| 734 | 213 |
| 730 | 214 |
| 727 | 215 |
| 723 | 216 |
| 720 | 217 |
| 717 | 218 |
| 713 | 219 |
| 710 | 220 |
| 707 | 221 |
| 704 | 222 |
| 701 | 223 |
| 698 | 224 |
| 694 | 225 |

| Frequ. | Factor |
|--------|--------|
| 691 | 226 |
| 688 | 227 |
| 685 | 228 |
| 682 | 229 |
| 679 | 230 |
| 676 | 231 |
| 673 | 232 |
| 671 | 233 |
| 668 | 234 |
| 665 | 235 |
| 662 | 236 |
| 659 | 237 |
| 657 | 238 |
| 654 | 239 |
| 651 | 240 |
| 648 | 241 |
| 646 | 242 |
| 643 | 243 |
| 640 | 244 |
| 638 | 245 |
| 635 | 246 |
| 633 | 247 |
| 630 | 248 |
| 628 | 249 |
| 625 | 250 |
| 623 | 251 |
| 620 | 252 |
| 618 | 253 |
| 615 | 254 |
| 613 | 255 |

| Frequ. | Factor |
|--------|--------|
| ΦT256 | |
| 9.766 | 1 |
| 4.883 | 2 |
| 3.255 | 3 |
| 2.441 | 4 |
| 1.953 | 5 |
| 1.628 | 6 |
| 1.395 | 7 |
| 1.221 | 8 |
| 1.085 | 9 |
| 977 | 10 |
| 888 | 11 |
| 814 | 12 |
| 751 | 13 |
| 698 | 14 |
| 651 | 15 |
| 610 | 16 |
| 574 | 17 |
| 543 | 18 |
| 514 | 19 |
| 488 | 20 |
| 465 | 21 |
| 444 | 22 |
| 425 | 23 |
| 407 | 24 |
| 391 | 25 |
| 376 | 26 |
| 362 | 27 |
| 349 | 28 |
| 337 | 29 |
| 326 | 30 |
| 315 | 31 |

SER5 - Serial interfaces through software with internal Timer

| Frequ. | Factor |
|--------|--------|
| 305 | 32 |
| 296 | 33 |
| 287 | 34 |
| 279 | 35 |
| 271 | 36 |
| 264 | 37 |
| 257 | 38 |
| 250 | 39 |
| 244 | 40 |
| 238 | 41 |
| 233 | 42 |
| 227 | 43 |
| 222 | 44 |
| 217 | 45 |
| 212 | 46 |
| 208 | 47 |
| 203 | 48 |
| 199 | 49 |
| 195 | 50 |
| 191 | 51 |
| 188 | 52 |
| 184 | 53 |
| 181 | 54 |
| 178 | 55 |
| 174 | 56 |
| 171 | 57 |
| 168 | 58 |
| 166 | 59 |
| 163 | 60 |
| 160 | 61 |
| 158 | 62 |
| 155 | 63 |

| Frequ. | Factor |
|--------|--------|
| 153 | 64 |
| 150 | 65 |
| 148 | 66 |
| 146 | 67 |
| 144 | 68 |
| 142 | 69 |
| 140 | 70 |
| 138 | 71 |
| 136 | 72 |
| 134 | 73 |
| 132 | 74 |
| 130 | 75 |
| 128 | 76 |
| 127 | 77 |
| 125 | 78 |
| 124 | 79 |
| 122 | 80 |
| 121 | 81 |
| 119 | 82 |
| 118 | 83 |
| 116 | 84 |
| 115 | 85 |
| 114 | 86 |
| 112 | 87 |
| 111 | 88 |
| 110 | 89 |
| 109 | 90 |
| 107 | 91 |
| 106 | 92 |
| 105 | 93 |
| 104 | 94 |
| 103 | 95 |

| Frequ. | Factor |
|--------|--------|
| 102 | 96 |
| 101 | 97 |
| 100 | 98 |
| 99 | 99 |
| 98 | 100 |
| 97 | 101 |
| 96 | 102 |
| 95 | 103 |
| 94 | 104 |
| 93 | 105 |
| 92 | 106 |
| 91 | 107 |
| 90 | 108 |
| 90 | 109 |
| 89 | 110 |
| 88 | 111 |
| 87 | 112 |
| 86 | 113 |
| 86 | 114 |
| 85 | 115 |
| 84 | 116 |
| 83 | 117 |
| 83 | 118 |
| 82 | 119 |
| 81 | 120 |
| 81 | 121 |
| 80 | 122 |
| 79 | 123 |
| 79 | 124 |
| 78 | 125 |
| 78 | 126 |
| 77 | 127 |

| Frequ. | Factor |
|--------|--------|
| 76 | 128 |
| 76 | 129 |
| 75 | 130 |
| 75 | 131 |
| 74 | 132 |
| 73 | 133 |
| 73 | 134 |
| 72 | 135 |
| 72 | 136 |
| 71 | 137 |
| 71 | 138 |
| 70 | 139 |
| 70 | 140 |
| 69 | 141 |
| 69 | 142 |
| 68 | 143 |
| 68 | 144 |
| 67 | 145 |
| 67 | 146 |
| 66 | 147 |
| 66 | 148 |
| 66 | 149 |
| 65 | 150 |
| 65 | 151 |
| 64 | 152 |
| 64 | 153 |
| 63 | 154 |
| 63 | 155 |
| 63 | 156 |
| 62 | 157 |
| 62 | 158 |
| 61 | 159 |

SER5 - Serial interfaces through software with internal Timer

| Frequ. | Factor |
|--------|--------|
| 61 | 160 |
| 61 | 161 |
| 60 | 162 |
| 60 | 163 |
| 60 | 164 |
| 59 | 165 |
| 59 | 166 |
| 58 | 167 |
| 58 | 168 |
| 58 | 169 |
| 57 | 170 |
| 57 | 171 |
| 57 | 172 |
| 56 | 173 |
| 56 | 174 |
| 56 | 175 |
| 55 | 176 |
| 55 | 177 |
| 55 | 178 |
| 55 | 179 |
| 54 | 180 |
| 54 | 181 |
| 54 | 182 |
| 53 | 183 |
| 53 | 184 |

| Frequ. | Factor |
|--------|--------|
| 53 | 185 |
| 53 | 186 |
| 52 | 187 |
| 52 | 188 |
| 52 | 189 |
| 51 | 190 |
| 51 | 191 |
| 51 | 192 |
| 51 | 193 |
| 50 | 194 |
| 50 | 195 |
| 50 | 196 |
| 50 | 197 |
| 49 | 198 |
| 49 | 199 |
| 49 | 200 |
| 49 | 201 |
| 48 | 202 |
| 48 | 203 |
| 48 | 204 |
| 48 | 205 |
| 47 | 206 |
| 47 | 207 |
| 47 | 208 |
| 47 | 209 |

| Frequ. | Factor |
|--------|--------|
| 47 | 210 |
| 46 | 211 |
| 46 | 212 |
| 46 | 213 |
| 46 | 214 |
| 45 | 215 |
| 45 | 216 |
| 45 | 217 |
| 45 | 218 |
| 45 | 219 |
| 44 | 220 |
| 44 | 221 |
| 44 | 222 |
| 44 | 223 |
| 44 | 224 |
| 43 | 225 |
| 43 | 226 |
| 43 | 227 |
| 43 | 228 |
| 43 | 229 |
| 42 | 230 |
| 42 | 231 |
| 42 | 232 |
| 42 | 233 |
| 42 | 234 |

| Frequ. | Factor |
|--------|--------|
| 42 | 235 |
| 41 | 236 |
| 41 | 237 |
| 41 | 238 |
| 41 | 239 |
| 41 | 240 |
| 41 | 241 |
| 40 | 242 |
| 40 | 243 |
| 40 | 244 |
| 40 | 245 |
| 40 | 246 |
| 40 | 247 |
| 39 | 248 |
| 39 | 249 |
| 39 | 250 |
| 39 | 251 |
| 39 | 252 |
| 39 | 253 |
| 38 | 254 |
| 38 | 255 |

SER5 - Serial interfaces through software with internal Timer

As an example we want to generate a baud rate of 2.400 Bd with *SER5_80_R1.TD2*. We use a receive over sampling and a transmit pre-scaler of 3, so we need a frequency of about 7.200:

```
INSTALL_DEVICE #SER5,"SER5_80_R1.TD2", &
8, & ' databits
0, & ' parity 0=no parity
0, & ' invert 0=true, 1=inverse
3, & ' tx Prescaler
3, & ' rx Oversample
1, & ' reserved, always 1
000b, & ' handshake, 0=no handshake
2, & ' timer range
87 ' divisor factor => 2.400 Bd
```

User-Function-Codes of the SER5_pp_xx.TD2

User-Function-Codes for inquiries (instruction GET):

| No | Symbol Prefix UFCI_ | Description |
|----|------------------------|---|
| 1 | UFCI_IBU_FILL | No. of bytes in input buffer (Byte) |
| 2 | UFCI_IBU_FREE | Free space in input buffer (Byte) |
| 3 | UFCI_IBU_VOL | Size of input buffer (Byte) |
| 33 | UFCI_OBU_FILL | Number of bytes in output buffer (Byte) |
| 34 | UFCI_OBU_FREE | Free space in output buffer (Byte) |
| 35 | UFCI_OBU_VOL | Size of output buffer (Byte) |
| 65 | UFCI_LAST_ERRC | Last error code |
| 99 | UFCI_DEV_VERS | Driver version |

If there is not enough space in the output buffer and you nevertheless wish to output the instruction PUT or Print (and thus the complete task) waits until space once again becomes free in the buffer.

Example: inquire the level of the output buffer to determine whether there is enough space for the output:

```
GET #2, #0, #UFCI_OBU_FILL, 0, wVarFill
IF wVarFill > (LEN(A$)+2) THEN      ' A$ + CR + LF
  PRINT #2, #0, A$
ENDIF
```

SER5 - Serial interfaces through software with internal Timer

User-Function-Codes for the instruction PUT following command:

| No | Symbol Prefix: UFCO_ | Description |
|-----|-------------------------|--|
| 1 | UFCO_IBU_ERASE | Delete input buffer |
| 33 | UFCO_OBU_ERASE | Delete output buffer |
| 94 | UFCO_SET_SERIAL | set serial parameter |
| 128 | UFCO_SET_ISEP | set limiter characters for instruction INPUT |
| 129 | UFCO_RES_ISEP | delete limiter characters for INPUT |
| 130 | UFCO_SET_BAUDRATE | Set new baud rate |

Example: send data on channel 1 & 2:

```
PUT #SER5, #0, "Data on channel-0"  
PUT #SER5, #1, "Data on channel-1"
```

Example: set new parameter on serial channel. The parameters will be output in the same way as in the INSTALL line, but only the first 5 parameters are authorised:

```
data,par,inv,TxPre,RxOvs,-,handshake  
PUT #SER5, #0, #UFCO_SET_SERIAL, 8, 3, 1, 3, 3,1, 0
```

Comma AND return ARE REGARDED AS SEPARATOR CHARACTERS BY DEFAULT FOR THE INSTRUCTION INPUT. THE SEPARATOR CHARACTERS CAN BE CHANGED USING THE USER-FUNCTION-CODE UFCO_SET_ISEP. BEFORE SETTING NEW CHARACTERS THE ALREADY SET CHARACTERS CAN BE DELETED. THE CHARACTERS TO BE SET OR DELETED ARE SPECIFIED AS CODE AREAS:

PUT #D, #C, UFCO_SET_ISEP, *Startcode*, *Endcode*, *Startcode*, *Endcode*

If you delete the standard separators without setting new ones an INPUT instruction will only be terminated when the Input buffer is full.

Example: set new separator LINE-FEED for the instruction input on the serial channel 0:

```
PUT #2,#0, #UFCO_RES_ISEP, 0, 255 \ delete all separators  
PUT #2,#0, #UFCO_SET_ISEP, 10, 10 \ set Line-Feed as separator
```

Example: set all control characters as well as characters as of 7Fh as separator characters for the instruction input on the serial channel 0:

```
PUT #2, #0, #UFCO_RES_ISEP, 0, 255      \ delete all separators
                                           \ set new code area as separators
PUT #2, #0, #UFCO_SET_ISEP, 0, 31, 127, 255
```

Example: delete comma as separator character for the instruction input on the serial channel 0:

```
PUT #2, #0, #UFCO_RES_ISEP, 2ch, 2ch    \ delete comma as separator
\ oder
PUT #2, #0, #UFCO_RES_ISEP, ',', '      \ delete comma as separator
```

A further example:

```
PUT #1, #0, #UFCI_SET_ISEP, 'acXZ55'
\ set as INPUT separators the following characters:
\      a, b, c, X, Y, Z, 5
```

Changing the baud rate

PUT #D, #0, #UFCO_SET_BAUDRATE, clock, factor

D is a constant, variable or an expression of data type WORD, LONG, BYTE in the range 0...63 and stands for the device number of the driver.

clock is a constant, variable or an expression of data type BYTE and contains the clock select:

SER5_pp_xx.TD2:

1:ΦT1

2:ΦT4

3:ΦT16

SER5B_pp_xx.TD2:

1:ΦT1

2:ΦT16

3:ΦT256.

factor is a constant, variable or an expression of data type BYTE and contains the Divisor factor. This parameter determines the factor by which the basic clock pulse is divided. For details read *setting the baud rate*.

Example:

```
PUT #SER5, #0, #UFCO_SET_BAUDRATE, 2, 87 ' set 2.400 Bd for SER5_pp_xx.TD2
```

Documentation History

| Version of Documentation | Version of SER5 | Description / Changes |
|--------------------------|-----------------|---------------------------------|
| 002 | 1.00a | - first version |
| 003 | 1.00a | - some phrasings changed |
| 004 | 1.00a | - some phrasings changed |
| 005 | 1.00a | - SER5_3672_xx.TD2 |
| 006 | 1.00b | - Install_device default values |