1 Transfer- Packet structure for **bidirectional Communication**

The data will sent by a defined packet structure. The size of the packets depends on type and number of receivers.

1.1 Protocol Description:

- Data for RF Chip CC1101 (auto transferred)
- Data PLN Layer (NWK and MAC)
- Data Payload

-	Preamble	12 Byte
-	Sync-Word	4 Byte
-	Length	1 Byte
-	Pkt-Cnt	1 Byte
-	Pkt-Info	1 Byte
-	Pkt-Info_2	1 Byte
-	Hop-Info	1 Byte
-	Syst-Addr.	1 Byte
-	Source-Group	1 Byte
-	Source-Addr.	3 Byte
-	Backward Addr	3 Byte
-	Forward Addr	3 Byte
-	Dest-Cnt	1 Byte
-	Destination	1 Byte (Group) – (1-10 Receiver) *3 Byte(variable)
-	Payload	10 Byte
-	[RSSI	1 Byte] // only RX
-	[LQI	1Byte] // only RX
-	CRC_LQI	2 Byte
-	total TX	46 Byte – 75 Byte (FIFO: 28 Byte – 57 Byte)
-	total RX	48 Byte – 77 Byte (FIFO: 28 Byte -57 Byte)

1.2 RF Chip parameter setup:

Frequency	918,3 MHz +/- 10 ppm
Deviation	35 kHz
Baud rate	76,8 kBaud
Data encoding	NRZ
Modulation	GFSK
TX max.	10 dBm @ 50 Ohm / Power according to FCC regulation
Receiver bandwidth	232 kHz
Application remote control	control actuator (control signal)
Application sensor	control actuator (data signal)

All tolerances result from the derived PPL of 26 MHz +/- 10 ppm with the digital register transceiver settings.

1.3 Duty cycle estimation

- Traffic time (time to air): min. 4,3 ms / data protocol
  max. 7,1 ms / data protocol
- Normally volume of traffic: </= 8 x traffic events/d by user about transmitter
  (= 0,33 traffic events per hour)

1.3.1 Transmission modes

- Broadcast transmission (group > 10 destinations, no routing path)
  - Transmission of max. 1 * data protocol (4,3 ms)
  - < 5 ms / user initiated event

- Unicast for 1 destination
  - Transmission of max. 2 * data protocol (2 * 4,3ms, cut off > 100 ms between sending)
  - < 9 ms / user initiated event

- Unicast for 10 destination
  - Transmission of max. 2 * data protocol (2 * 7,1 ms, cut off > 100 ms between sending)
  - < 15 ms / user initiated event

1.3.2 Estimation of duty cycle (worst case)

- Broadcast (group) max. traffic time = 5 ms
  - max. traffic time * Normally volume of traffic per hour = 5 ms * 0,33 = **0,0016 s/h**

- Unicast for 1 destination max. traffic time = 9 ms
  - max. traffic time * Normally volume of traffic per hour = 9 ms * 0,33 = **0,003 s/h**

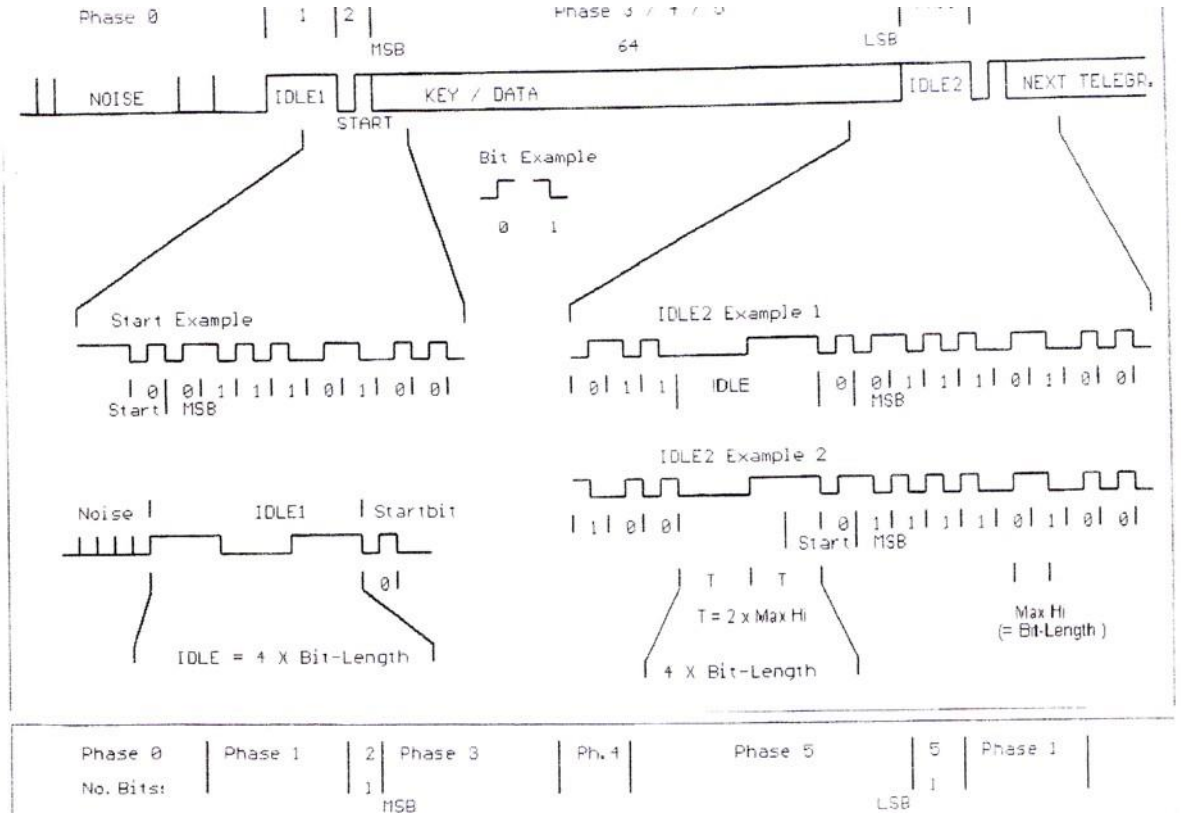
- Unicast for 10 destinations max. traffic time = 15 ms
  - max. traffic time * Normally volume of traffic per hour = 15 ms * 0,33 = **0,005 s/h**

2 Transfer- serial bit stream for **unidirectional Communication**

- Transfer of 64 data bits with IDLE- Phase (manchester coded)

	MSB															LSB
Nibble-Pos.	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Wort-Nr.	1 (16 Bit)				2 (16 Bit)				3 (4Bit Parity & 12 Bit)				4 (16 Bit)			
Bits	16				16				4	4	20				2	1	1
Bez.	Sync- Counter (SC)				DATA				P	MC	Ser.-Nr. (SNR /ID)				RS	SW	B
									KEY								

B		originator- code (4 Bit)
A		Group- Code (4 Bit)
9	8	Data- Code (8 Bit), MSB first



2.1 Duty cycle estimation

Format:	Manchester code, 64 Bit
Baud rate:	1200 Baud (**833 µs +/- 21 µs**)
Bit rate:	2400 Bps (**416 µs +/- 21 µs**)
Bit0:	edge 0 to 1 (TTL)
Bit1:	edge 1 to 0 (TTL)

IDLE1: 4 x bit length H + 4 x bit length L + 4 x bit length H
= 1,66 ms H + 1,66 ms L + 1,66 ms H = **4,992 ms**

IDLE2: 4 x bit length L + 4 x bit length H
= 1,66 ms L + 1,66 ms H = **3,328 ms**

Start bit always 0 (416 µs)
Tolerance 5% to duty cycle

Telegram: IDLE1 + start bit + 64 data bit = **32,03 ms**
Telegram (3x): 3x Telegram + 2x IDLE2 = **102,65ms**

- Traffic time (time to air): 102,65 ms / data protocol
- Normally volume of traffic: </= 8 x traffic events/d by user about transmitter (= 0,33 traffic events per hour)

2.1.1 Estimation of duty cycle (worst case)

- Broadcast (group)/Unicast(1-10 destinations) max. traffic time = 102,65 ms
  - max. traffic time * Normally volume of traffic per hour = 102,65 ms * 0,33 = **0,033s/h**

2.2 RF Chip parameter setup:

Frequency	915,300 MHz +/- 10 ppm
Deviation	35 kHz
Data rate	2400 bps
Baud rate	1200 Baud
Data encoding	Manchester
Modulations	2-FSK
TX max.	10 dBm @ 50 Ohm / Power according to FCC regulation
Receiver bandwidth	325 kHz
Application remote control	control actuator (control signal)
Application sensor	control actuator (data signal)

All tolerances result from the derived PPL of 26 MHz +/- 10 ppm with the digital register transceiver settings.