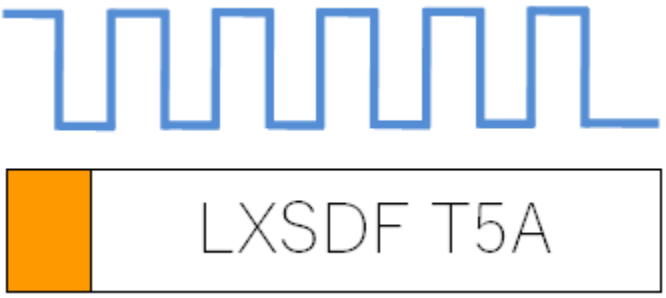
LXSDF T5A

LX Serial Data Format T5A

Doc. ID. LXE8 V1

Release Date. 2018-04-27

Abstract - Simple packet and protocols easy to use. UART, Bluetooth, WiFi, Ethernet, etc. Extremely simple packet and easy to use. Multi channel real time stream transmission. Support both Stream Mode and Non-Stream Mode.

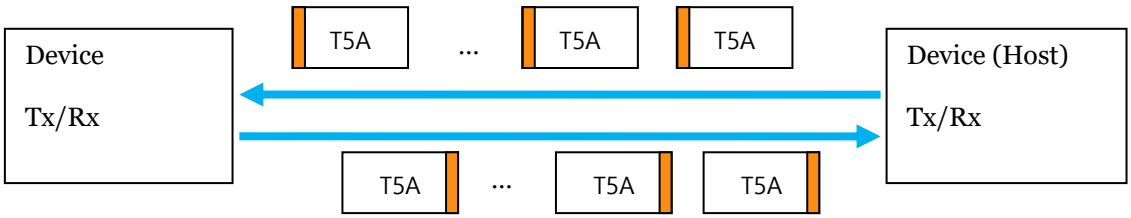


Contents

LXSDF T5A Overview

LXSDF T5A is a general purpose serial communication standard which is able to transmit real-time multi channel stream data and non-stream data. A typical example of multi channel stream is the time series data converted by the multi channel ADC(Analog to Digital Converter). LXSDF T5A packet is so simple and small packet size. LXSDF T5A can be used in any system using uart, wifi, bluetooth and ethernet etc.

UART(com port, serial port) is the most commonly used serial communication. UART can transmit one byte sequentially, but it rarely happens that sends only one byte of data element needed in Communication in real applied process. For example, when transmitting 12 bit AD converted data, must transmit serial communication 2 bytes dividing 4 bits and 8 bits and unify them into one 12bits data in receiver. If there are various kinds of data to transmit, it is in need of packet concept. LXSDF T5A can handle several bytes as one packet, transmitting and receiving sides use the data by separating according to the standard LXSDF T5A.



T5A Packets for Stream & Non-Stream Communications

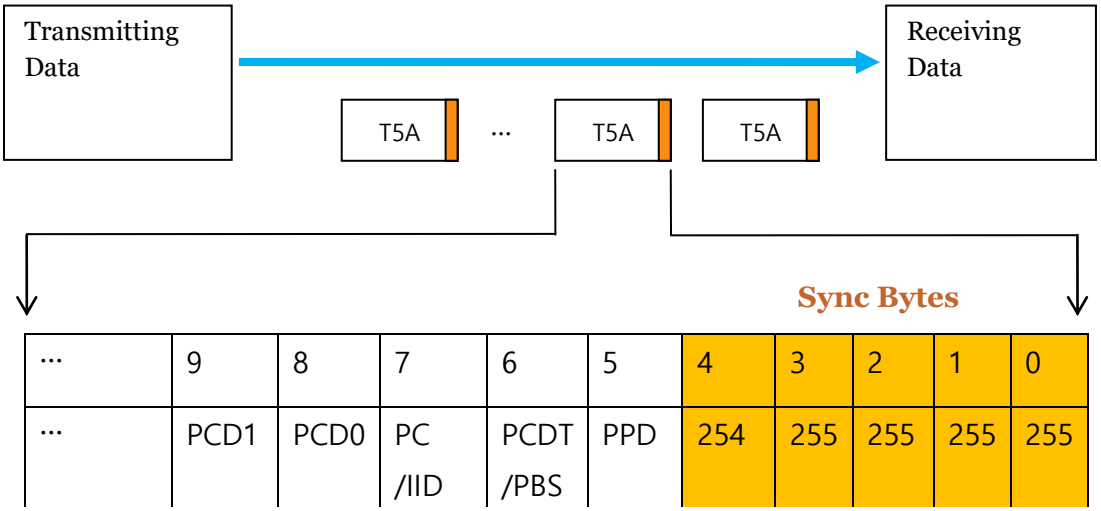
T5A Packet

Sync Bytes : the core concepts of T5A Packet

LXSDF T5A packet uses initial 5 bytes for each packet transmission as “Purpose for Synchronizing Packet”. The first four bytes are allocated the fixed value 255(0xFF in hex), and fixed 254 (0xFE in hex) for fifth byte. Namely, Sync Bytes are designed only in the spots where appear 255, 255, 255, 255 and 254 sequentially in the whole packet byte arrays.

Receiving side should check each byte and extracts “Sync Bytes”, so it can find the starting spot of 1 packet. Once finding the starting spot, it is able to extract the data needed in the program under the packet Standard.

The following picture indicates that the orange color part in the one packet is assigned “Sync. Bytes” and then a series of bytes for one packet.



···	9	8	7	6	5	4	3	2	1	0
···	PCD1	PCD0	PC /IID	PCDT /PBS	PPD	254	255	255	255	255

T5A Packet Definitions

The table shows the definitions of T5A packet. Each index is one byte and transmitted in order when transmitting serial. An available value for each packet index, the terms of the packet elements.

Index	Value	Packet Element Name for Stream Mode	Packet Element Name for Non-Stream Mode
0	255	SyncByte0 (Synchronization Byte 0)	
1	255	SyncByte1 (Synchronization Byte 1)	
2	255	SyncByte2 (Synchronization Byte 2)	
3	255	SyncByte3 (Synchronization Byte 3)	
4	254	SyncByte4 (Synchronization Byte 4)	
5	0~254	PPD (Packet Property Data). 0~15 : Stream Mode, 16~254 : Non-Stream Mode.	
6	0~255	PCDT (PCD Type) : Bit 2,1,0.	PBS (Packet Byte Size)
7	0~255	PC (Packet Count)	IID (Information ID)
8	0~255	PCD0 (Packet Cyclic Data 0)	
9	0~255	PCD1 (Packet Cyclic Data 1)	
10	0~253	PCD SEP	
11	0~255	PUD0 (Packet Unit Data 0)	
12	0~255	PUD1 (Packet Unit Data 1)	
13	0~255	PUD2 (Packet Unit Data 2)	
14	0~255	PUD3 (Packet Unit Data 3)	
15	0~253	PUD SEP	
16	0~255	PSD0 (Packet Stream Data 0)	
17	0~255	PSD1 (Packet Stream Data 1)	
18	0~255	PSD2 (Packet Stream Data 2)	
19	0~255	PSD3 (Packet Stream Data 3)	
20	0~253	PSD SEP	
...	...	Can be repeated above 16~20 index	

Color	Description
	Common packet elements for both Stream Mode and Non-Stream Mode
	Data placement for multi channel stream data. Freely expandable to any number of channels. The typical example of the multi channel stream data is the continuous output of a multi channel ADC(Analog to Digital Converter).

Difference between Stream & Non-Stream Mode

Packet Index	Stream Mode	Non-Stream Mode
5	**PPD** : available value 0 ~ 15	**PPD** : available value 16 ~ 254
6	**PCDT** : PCD Type. Bit2,1,0.	**PBS** : Packet Byte Size allocated.
7	**PC** : +1 for each packet.	**IID** : Information ID allocated.
8~10	**PCD0,1,PCD SEP** : PCD data is allocated each PC.	general data allocated.
11~15	**PUD0,1,2,3, PUD SEP :** Packet Unit Data	general data allocated.
16 and over	**PSD** : real time stream data allocated.	general data allocated.

Packet Byte Size

- Stream Mode : Predefined fixed value. ex. 16, 32, ..., etc depends on applications. .
- Non-Stream Mode : Determined by packet index 6(PBS) per each packet

Packet for Stream Mode

PPD (Packet Property Data)

Available 0 ~ 15 for Stream Mode.

PC (Packet Count)

+1 for every one packet transmission and start 0 again after the maximum value.

By using PC, it is necessarily used to identify the data transmitted to PCD every packet.

The maximum of PC value gets different value according to PCD Type value. If PCDT is 0, PC maximum is 31.

PCD 0,1. PCD SEP (Packet Cyclic Data)

Different values are allocated at each PC (Packet Count). Allocated data is different for each product.

PUD 0~3. PUD SEP (Packet Unit Data)

Mainly, information data to transmit at high speed is allocated. Allocated data is different for each product.

PSD 0~3. PSD SEP (Packet Stream Data)

Mainly, multi channel steam data is allocated. Allocated data is different for each product.

PCDT (Packet Cyclic Data Type)

PC maximum depends on PCDT value and data transmitted to packet cyclic data depends on PCDT value. PCDT is always 0 for the first stage(device power ON) and though PCD mode value is changed into different value like 1,2,3.. on the situation, it is changed into 0 automatically by completing data transmission of the mode one time.

PCDT	PC (Packet Count) Maximum	Data
0	31	Exclusive data for LXSDF T5A and general data.
1 ~ 7	Depends on each products	

LXSDF T5A PCD Designated Data for PCDT 0

The section from PC 0 to 19 is for transmitting product's specialized data and the section from PC 20 to PC 31 is for system designated data. The system exclusive data is explained as below table.

PCD0,1[PC]	Item	Description
PCD0,1[31]	Com port search information	PCD0[31] : fixed value 110. Information for searching device using LXSDF T5A.
PCD0,1[30]	LXDeviceID	Allocated value between 256 and 65535. Unique ID for identifying the device. PCD0[30] : Low Byte, PCD1[30] : High Byte.
PCD0,1[29]	ComFirmInfo1	PCD0[29] : Bit ComFirmID, Bit6~0: ComFirmVersion for processor 1.
PCD0,1[28]	Number of channel	PCD0[28] : Number of channel in the element PSD(Packet Stream Data).
PCD0,1[27]	Number of samples	PCD0[27] : Number of sample in the element PSD(Packet Stream Data).
PCD0,1[26]	ComPath	PCD0[26] : Communication physical path.
PCD0,1[25]	ComFirmInfo2	PCD0[25] : Bit ComFirmID, Bit6~0: ComFirmVersion for processor 2.
PCD0,1[24]	ComFirmInfo3	PCD0[24] : Bit ComFirmID, Bit6~0: ComFirmVersion for processor 3.
PCD0,1[23]	-	Reserved
PCD0,1[22]	-	reserved
PCD0,1[21]	-	reserved
PCD0,1[20]	-	reserved

ComPath

ComPath is used for mark to show what physical path to transmit data. It is possible to transmit more than two communication path in one device. The host received the data refers to ComPath value to check the communication path.

Compath Value	Communication Path
0	UART
1	USB CDC
2	Bluetooth SPP(Serial Peripheral Profile)
3	Bluetooth Low Energy SPS
64	USb LX High Speed. (FTDI's D2XX deriver or FTDI's VCP driver)

Packet for Non-Stream Mode

PPD (Packet Property Data)

Available 16 ~ 254 for Non-Stream Mode.

Predefined PPD values : 32, 34, 48, 64, 128 for designated communication types.

- 32 : Data send without request result.
- 34 : Data send with request result.
- 48 : Send result in response to PPD=34
- 64 : Request data.
- 128 : Send data in response to PPD=64.

PBS (Packet Byte Size)

Packet byte size is allocated. Packet bytes size is equal to the packet index maximum – 1.

IID (Information Identification Data)

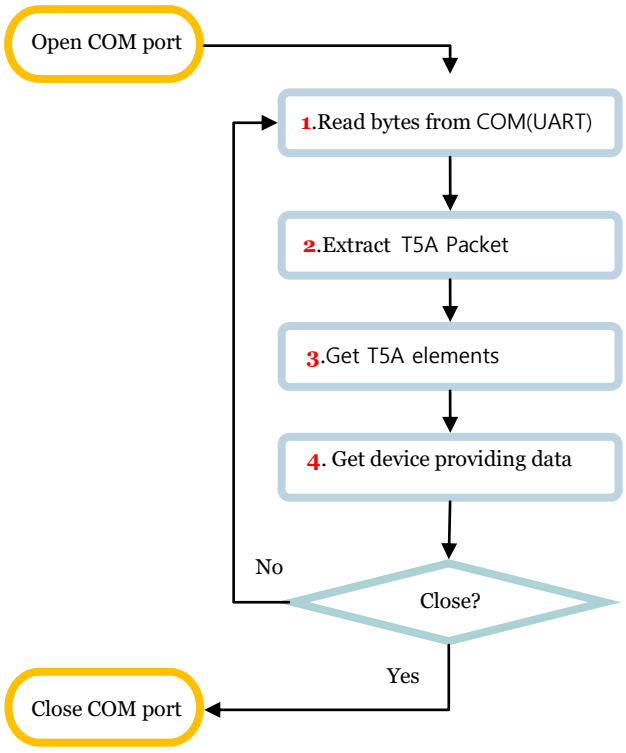
Identification number is allocated. The purpose of ID number is identifying the packet contents.

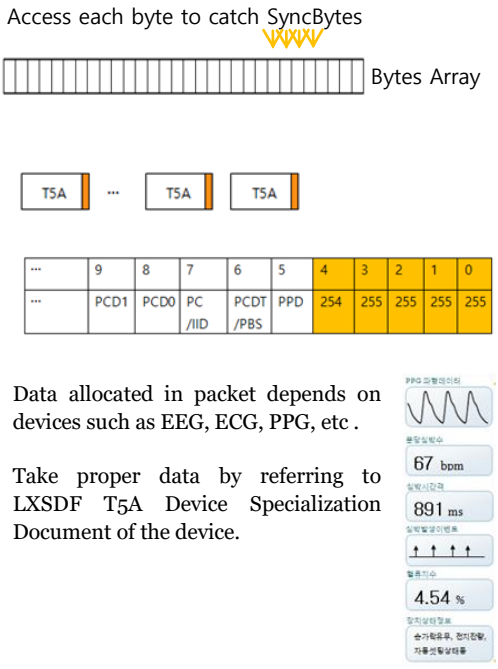
Programming Guides

The following picture shows the programming flow of host side.

First of all, open com port in host. After that,

1. Read Bytes from COM : Read bytes received from com port(UART) in order.
2. Extract T5A packet : Catch Sync Bytes (it is placed in order of 255,254) which means packet's start spot from byte row separates data up and then abstract data elements in the packet from
3. Get T5A element : Get all the T5A Packet elements.
4. Get device providing data : Data allocation situation depends on each device. Refer to LXSDF T5A Device Specialization Documents of the device.





Appendix A. COM PORT AUTOMATIC SEARCH METHOD.

This explanations are for the device search in case device like PC. The PC attached device's com port number assignment is not fixed. If connecting MCU and UART in Embedded System, it doesn't need automatic search.

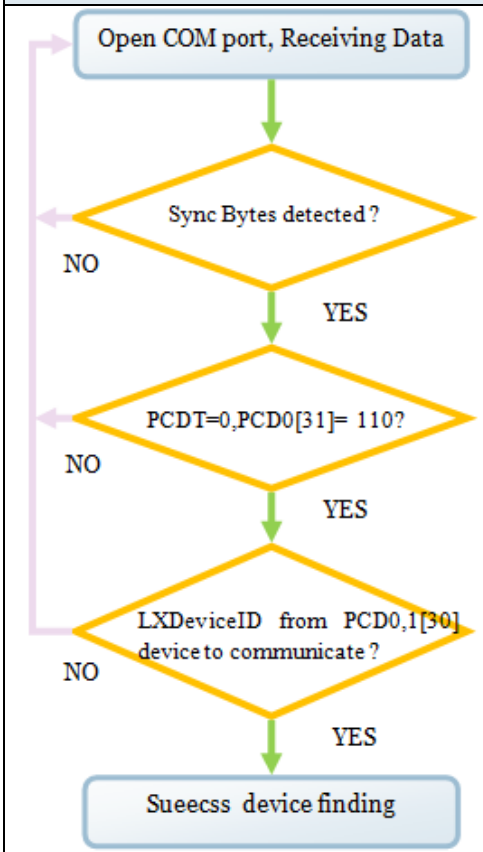
Abstract

In case of device detecting COM port from host, there is case that user choose COM port to communicate in application program. This means bad products design regardless of user's convenience. It has to be designed that the program search COM port connected with device automatically. This function can not be solved only by software. It has to set the function to search automatically in the device.

COM port search method.

In LXSDF T5A packet, PCD "Com port search information" which is PCD Type 0 and PCD0[31] "LXDeviceID" which is PCD0[30] and PCD1[30] is used to find proper COM port of the product for information to use device search.

You can find the device's COM port easily if practicing the procures as the following explanation cycling all the Com port from host in order. Open one COM port temporarily and process the data received by byte unit like the following table.

Flow Chart	Step	Description.
	Step 1	If sync bytes is detected : It's possible device to communicate. Goto step 2. If sync bytes is not detected : it's not LXSDF T5A packet. Start again opening another COM port.
	Step 2	If PC (PACKET COUNT) value becomes number 31 , it is sure of the device transmitting data to LXSDF T5A Format. However, it could transmit the same format data like LXSDF T5A in some products coincidentally. For occupying safely, if the PCD0[31] is 110, it is sure that is LXSDF T5A packet.
	Step 3	If device is communicated by LXSDF T5A format, the next phase is to search model to communicate. At this time, check PCD0,1[30] which is product's LXDeviceID to communicate.

Revision History

Release Date	Doc. ID	Description of Change
2018-04-27	LXE8 V1	First release.