

4. Editing the check sum

4.1 Algorithm as C-function

```
char *chksum(s)
char *s:
{
    static char s1 [3];
    register j = 0;
    while (*s)
        j += *s++;
    j %= 256;
    s1 [0] = ((j >> 4) & 0xF) + '0';
    s1 [1] = (j & 0xF) + '0';
    s1 [2] = '\0';
    return (s1);
}
```

4.2 Example

Establishing the check sum for the initialisation data set:

<u>symbol</u>	<u>hex code</u>	
STX	02	
I	49	
<hr/>		
Total:	4B	--> 04 + 30 = 34 : '4' 0B + 30 = 3B : ';'

Thus, the complete initialisation set should read as follows:

```
SI4;E
T T
X X
```

3.4.3 Transmit result listing

		Host
S 300		
Ex1t1c1st2c2s ..tncns	_____>	
	<_____	ACK
		W
ACK	<_____	
	_____>	
Ex2t1c1st2c2s ..tmcms	_____>	
	<_____	ACK
		W
ACK	<_____	
	_____>	
.....		
Exkt1c1st2c2s ..tlcls	_____>	
	<_____	ACK
		W
ACK	<_____	
	_____>	
S	_____>	
	<_____	ACK

3.4.4 Further examples

The patient with the number AX-172345-N-001 is the second in the patient listing requested by the host for the parameters TSH, T3 and T4 - with the following patient data set:

SP	2AX-172345-N-001	TSH	T3	T4	CCE
T					T
X					X

After completion of measurement, the following result data set is provided:

SEAX-172345-N-001	TSH 1234. 560T3	1.251T4	172.10CCE
T			T
X			X

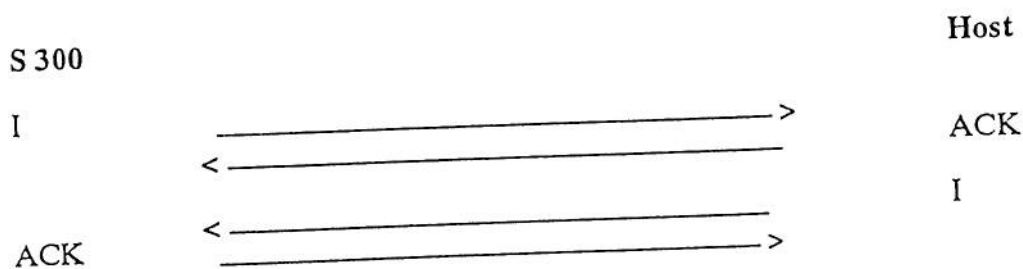
3.3 Error routines

After sending a data set, approx. 500 ms are allowed for an ACK or NACK acknowledgement by the receiver. If no acknowledgement is entered during this time, the data set will be repeated twice. If these repetitions are not acknowledged either, the transmission will be disrupted and an error prompt issued.

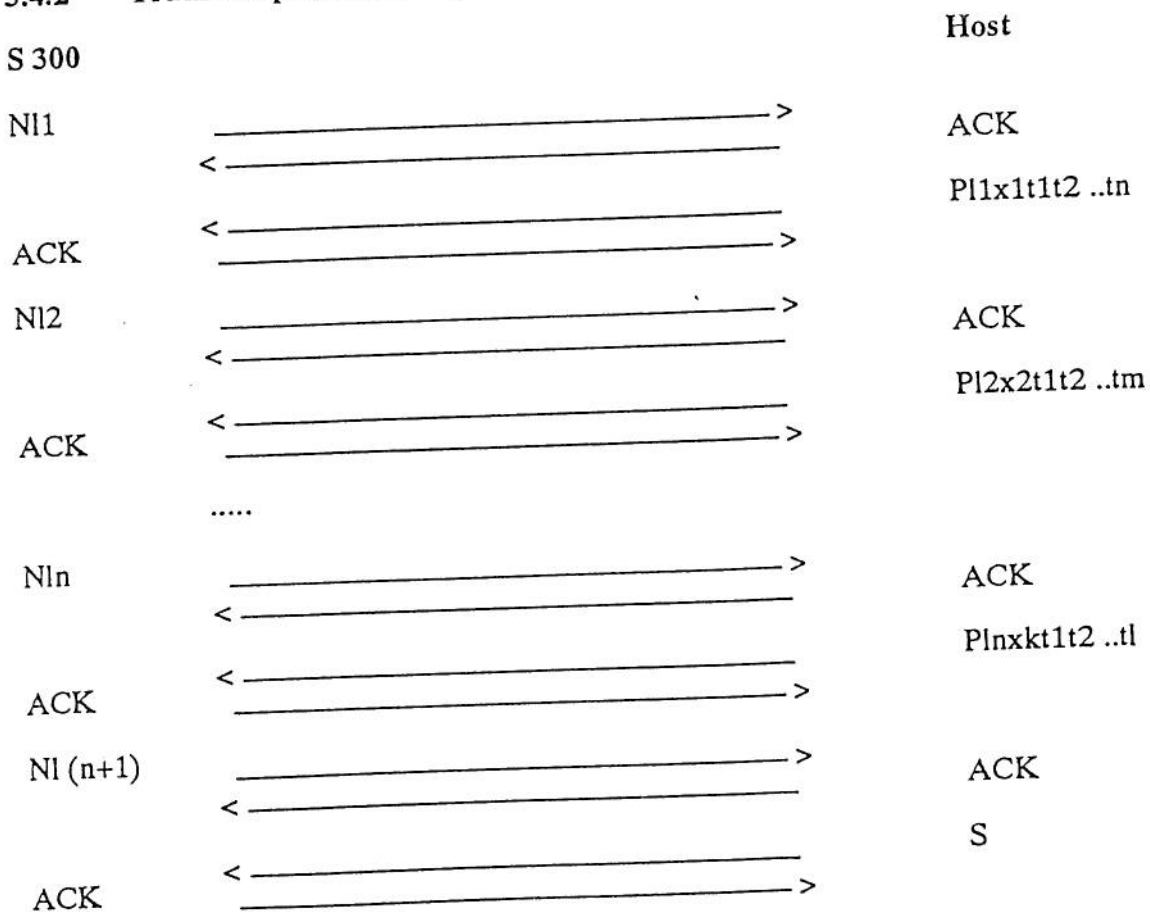
If a data set is acknowledged by NACK, the set will also be repeated twice. Should there be no positive acknowledgement, transmission will also be disrupted and an error prompt issued. The error prompt depends on the type of disruption.

3.4 Examples

3.4.1 Start transmission



3.4.2 Transmit patient listing



This data set is either sent from the host instead of a patient data set if no further patients are available or from the S 300 instead of a result data set when all results processed have been transmitted. After transmission of this data set, the S 300 will switch to off-line.

3.2.2.2 Result Set

- Marking : E
- Data : 24-digit patient ID followed by up to eight results (incomplete) each consisting of a 4-digit test ID, a 7-digit result and a 1-digit status.
- Format : SEiiiiiiiiiiiiiiiiiiiiittttccccccs ..ttttccccccsCCE
T T
X X

With the above result set, the results processed for a patient are transmitted.
In reply, the data set "next result" is expected.

The format of patient and test IDs is alphanumeric, left-justified and filled up with blanks.

Examples:

"123456789012345678901234" (patients)
"ABC-123456789-0"

"TSH" (tests)
"15-3"

The 7-digit result is a floating-point number with a maximum of 5 pre- and 3 suffix digits.
If less than 7 digits are required, the result is right-justified with leading blanks.

Examples:

"12345.6"
"123.456"
" 0.5"

The 1-digit status indicates the usability of the result. The following cases are provided for:

- | | | | |
|---------------------------------------|---|---|-------|
| - Measurement plausible | : | 0 | |
| - Measurement below normal range | : | 1 | (9) |
| - Measurement below lowest standard | : | 2 | (:) |
| - Measurement below evaluation range | : | 3 | (;) |
| - Measurement entered/edited manually | : | 4 | |
| - Measurement above normal range | : | 5 | (=) |
| - Measurement above highest standard | : | 6 | (>) |
| - Measurement above evaluation range | : | 7 | (?) |

The values in brackets are valid whenever measurement is uncertain due to equipment status.

- | | | |
|-----------------------------|---|---|
| - Request cancelled by user | : | A |
| - Request rejected | : | B |

3. Description of data format

3.1 Protocol

Communication is based on the so-called master-slave principle, whereby the S 300 adopts the master function, i.e. no communication will take place unless requested by the S 300.

Every data set sent to the host is acknowledged by a corresponding data set from the host.

Every data set is at once acknowledged by ACK or NACK. The S 300 will wait approx. 500 ms for the acknowledgement (see error routines). The S 300 waits approx. 10 s for the response to an acknowledged set, thereafter, the set will be repeated.

A different timing can be achieved by altering the configuration file.

Every data set carries the prefix STX and the suffix ETX.

Every data set contains a two-digit check sum formed from any character including STX (without ETX) which may be added directly before ETX (for algorithm, see appendix).

Every data set contains a one-digit marking from which the type of data that follows can be seen. This marking is directly appended to STX.

3.2 Markings

3.2.1 Initialisation of transmission

- Marking : I
- Data: : none
- Format : SICCE (CC = check sum)
T T
X X

If a transmission is initiated by the user, the S 300 sends an initialisation data set to the host and switches to on-line. The S 300 is now waiting for an initialisation data set from the host indicating that the host is ready for communication with the S 300.

3.2.2 Data sets sent from the S 300 to the host

3.2.2.1 Next patient

- Marking : N
- Data : 3-digit consecutive number
- Format : SNnnnCCE
T T
X X

With the above data set, the S 300 requests the transmission of the next patient data set. The answer expected is either another patient data set or the "end-of-list" set. For control purposes, the patient data set carries the same consecutive number. This number is numeric and right-justified with leading blanks.

2.2 Handover of results

The system provides for patient-related storage of test results. At any time, the user can force the transmission of results already processed, even if the list of parameters requested for a patient is incomplete. In such a case, all remaining requests remain stored in the system memory.

Handover to the host is *solely* initiated by the user.

A patient will be automatically deleted after all requests relating to him have been processed and successfully transmitted to the host. Explicit deletion by the user is not provided for; single patient-related requests may, however, be cancelled and are subsequently marked as "cancelled" when data are transmitted to the host.

For identification purposes, patient IDs and grammalogues remain unchanged when results are transmitted to the host. To these grammalogues, the corresponding results and a status field are added.

Whenever the user initiates a result transfer, all patients for whom at least one result is available are transmitted. All results measured for one patient are included in one data set. A data set only contains those tests whose results have been processed. Both these results and the related requests will be deleted automatically after successful transmission.

2.3 Processing of patient samples after stimulation

If both basal and stimulated serum samples from one patient shall be processed, the S 300 must treat them as if they were collected from two different patients since two different tubes are required for pipetting. If the host EDP provides for such an option, the stimulated serum sample should be given an ID of its own - e.g. by adding a suffix to the ID of the basal serum - and it is up to the host to bring together both results to establish the diagnosis.

This problem may, however, also be solved as follows: input of an additional test ID for the stimulated serum will make the S 300 treat basal and stimulated samples as different patients. In this case, the S 300 will generate a separate patient ID for the stimulated serum by adding _____ S to the array of characters issued. This ID will also appear in the placing list indicating where the tube containing the stimulated serum must be placed. The test results are again ascribed to the original patient and test ID.

Example:

For patient 1234567, TSH and TSH2 (= stimulated) are to be determined.

In the placing list will appear: 1234567 for TSH and 1234567 _____ S also for TSH.

Measurement results show the following values:
0.01 for 1234567 and 0.32 for 1234567 _____ S.

The following results are transmitted to the host:

1234567 TSH	0.01	and
1234567 TSH2	0.32.	

Host Communication S 300

Project:	Host communication S 300
Author:	Stiess
Updated on:	31-01-1992
S 300:	beginning with version 2.52

1. Minimum hardware requirements

The S 300 is equipped with a bidirectional RS-232 communications port connecting the signals RxD, TxD and GND.

The standard comms protocol has been adjusted as follows:

9,600 baud, 8 data bits, 1 stop bit, no parity

Changes are possible via a configuration file ---> LABINIT.SET

2.0 Tasks

2.1 Takeover of requests

A list of patients together with the associated tests are taken over from the host. This list is explicitly requested by the S 300 if initiated by the user's input. This guarantees that the S 300 is ready to receive. On the basis of this list the S 300 will generate a placing list for the user.

With every new request, the host only transmits those patients or tests that have not been transmitted before.

It is assumed that the patient identification is unmistakable. During transmission of the patient the S 300 checks whether or not any other requests for tests of the same patient have already been entered and if so, allocates them to this patient. It is therefore not absolutely necessary but desirable in favour of a reduction of transmission times, that all parameters to be determined for one patient are transmitted in one data set. This does, however, mean that a test X for a patient Y cannot be requested for a second time unless the result of the first request has been processed.

A 4-digit grammalogue is used for test identification. These grammalogues may be edited on the S 300 to establish a link between the parameter sets used by the S 300 and the test names normally used in the laboratory.

After transmission of the list the S 300 checks if a parameter set is available for each test request. If not, the requests will be automatically returned to the host as "rejected" (see next chapter).

Rejected requests are printed out in bulk as a result listing after host requests have been received and checked by the S 300. This list is also printed out when no request has been rejected (void list).



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On-line communication with laboratory EDP

Description of communications port