

# SEMA/SDS/MT Software API

## Electronic Medical Record System (GDT and ADIS) Interface Description

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### Application Note #5002



The Art of Diagnostics

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The Art of Diagnostics

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# 1 Introduction

## 1.1 General Information

The SCHILLER GDT Interface is based on the interface description originally compiled by QMS (Qualitätsring Medizinische Software; Quality Association for Medical Software). It provides a definition of a standardized interface between Electronic Medical Record (EMR) Systems and SCHILLER medical measuring instruments and information systems.

The parts of the original interface description relevant to the SCHILLER implementation of the GDT interface are here described, together with the specific SCHILLER implementation details. The original version 1.0 of the Interface Description is available for download at <http://www.qms-de.org/gdt/gdtbeschr.html>.

As the practical implementations of GDT differ from the specified standard in some aspects, the interface described here is that of SCHILLER devices and systems, which reflect the common implementation of GDT.

## 1.2 Glossary of Terms

Throughout this Interface Description, the following terms are used:

Term	Description
GTD	Geräte-Daten-Träger; or Device Data Carrier, the name of the interface
DEVICE	a medical device (or related driver), standalone unit or PC based measuring instrument
EMR System	Electronic Medical Record System (Praxis EDV-System)
COMPONENT	each party to data transfer, EMR System or DEVICE
SERVER	a COMPONENT that waits for external queries and commands and that is capable of processing them (a PC network "Server" answers workstation queries only)
CLIENT	a COMPONENT that issues queries and commands

The terms CLIENT / SERVER are used only to describe the send / receive relationship of components and are therefore not generally synonym with EMR Systems and DEVICE.

## 1.3 SCHILLER Devices and Systems

The following SCHILLER devices and software systems all natively implement the GDT interface (incl. versions implementing the interface described here):

- SDS Software:
  - AT-104 (SDS-104) .....v2.30
  - CS-200 (SDS-200).....v2.30
  - SEMA Light.....v2.31
  - SEMA-200 .....v2.31
- MT Software:
  - MT-200 .....v2.10
  - MT-300 .....v1.00

In addition to these devices and software systems, the SemalImport application (v2.00 or greater), which imports received examinations into the SEMA database, can be configured to automatically call the export handler of a locally installed SDS software after an examination has been imported.

This means that all of the following SCHILLER devices, which transmit examinations via RS-232 to SEMACOMM, or via TCP/IP to the SCHILLER Communication Server (SCS), are indirectly equipped with a GDT export interface:

- RS-232 via SEMACOMM:
  - AT-3
  - AT-5
  - AT-6
  - AT-60
  - AT-10
  - CS-100
  - AT-2 plus
  - AT-4
  - AT-101
  - AT-102
  - AT-10 plus
- TCP/IP via the SCHILLER Communication Server (SCS):
  - AT-101 (with SCM option)
  - AT-102 (with SCM option)
  - AT-10 plus
  - ARGUS PRO Monitoring System

## 2 Transport Protocol

### 2.1 Data Communication

Although different mechanisms for data communication is defined in the interface, the only one used in the SCHILLER implementation is the File Interface, where DEVICES and EMR Systems communicate via files that are created with a certain file name and in a certain directory, see "2.3 Communication via File" below.

### 2.2 Component Identification (GDT ID)

The components involved in the communication process are uniquely identified by the GDT ID. This ID is defined during installation. The ID is comprised of a total of 4 characters that are assigned in a manufacturer and device sensitive way.

As all information is assigned using these IDs, it is essential that all IDs be unique, especially in the case of multiple DEVICES (for example 2 ECG devices from the same manufacturer).

### 2.3 Communication via File

#### 2.3.1 File Names

Data are transferred via GDT compliant files. The file name syntax is defined as follows:

**<receiver\_gdt\_id><sender\_gdt\_id>.<incremental\_number>**

The file name consists of 4 characters to indicate the receiver plus 4 characters to indicate the sender of the file (for example: EMR1SCH1.005).

The file extension is a three-digit number that increases incrementally as it is assigned to a certain file name. The incremental number starts with the extension .000 (with leading zeros). This ensures that multiple files can be sent, for example from a DEVICE to an EMR System.

If a system supports one fixed file name only, the extension for this file should always be .000. During installation, you can choose a device-specific setting for the file type (fixed or progressive) you want to use, and if another extension than .000 shall be used for fixed files.

Files are generated by the sender with the extensions increasing incrementally. The receiver must process the files using FIFO and must delete them after reading. If fixed extensions are used, and a file with the extension .000 still exists (i.e. its receiver has not read it yet), the sender may overwrite it (resulting in a loss of data).

#### 2.3.2 Directory

During system configuration, you choose the drive and the directory used to read and write the GDT communication files. This information is also needed during device/EMR configuration.

*The MT-200/MT-300 always uses the same system defined directory for both import and export.*

*The AT-104/CS-200/SEMA uses different system defined export and import directories (default: <root>\SDSEXP for export and <root>\SDSIMP for import).*

## 2.4 GDT Line Syntax

A line in a GDT compliant file always has the following structure:

```
XXXXYYYYNNNNNNNN...<CR><LF>
```

XXX	:	number of characters in a line including CR LF
YYYY	:	line contents field label
NNNNNNNN...	:	GDT field contents
<CR><LF>	:	end of line (CR LF / 0Dhex 0Ahex)

For example: "0163101Schmidt<CR><LF>".

## 2.5 Character Set

The character set allowed within GDT fields is the ASCII or ANSI character set with characters > 20hex (32dec).

*In MT-200/MT-300 it is possible to choose between ANSI and ASCII export character sets. In AT-104/CS-200/SEMA it is always hard coded as ANSI.*



## 3 Application Protocol

Below are descriptions of the record type definitions 6300, 6301, 6302, 6310, and 6311, that have been defined for linking medical devices.

The record type 6300 "Request Patient Demographics" requires a record type 6301 "Send Patient Demographics" reply. All remaining record types (6301, 6302, 6310, and 6311) may be transmitted at any time and do not require a reply.

*In the descriptions below, the abbreviation "SDS" stands for the SEMA, AT-104, and CS-200 software, and the abbreviation "MT" stands for the MT-200 and MT-300 software.*

### 3.1 Field Label Definitions

#### 3.1.1 Definition of Record Type Identifications (8000)

Each record starts with the field 8000 "Record Type Identification" which contains its record type definition.

Code	Description	Direction of Communication	SDS	MT
6300	Request patient demographics	DEVICE -> EMR System		✓
6301	Send patient demographics	EMR System -> DEVICE	✓	✓
6302	Request new examination	EMR System -> DEVICE	✓	
6310	Send data of an examination	DEVICE -> EMR System	✓	✓
6311	Show data of an examination	EMR System -> DEVICE	✓	

#### 3.1.2 Definition of Examination Types (8402)

Some examination specific record types (6302, 6310, and 6311) contain the field label 8402 "Examination Type" to identify the type of test that is contained in the record. SCHILLER devices and systems recognize the following examination types:

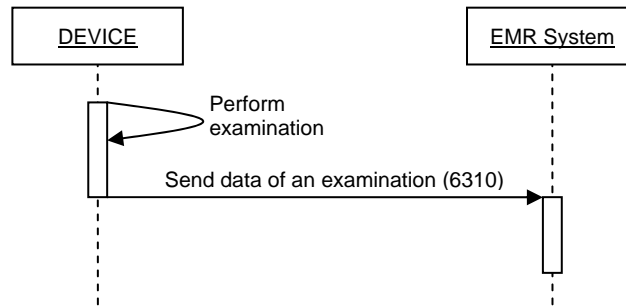
Code	Examination Type	SCHILLER Software
EKG01	Resting ECG	SEMA*, AT-104, CS-200
ERGO01	Stress ECG	SEMA*, AT-104, CS-200
LUFU00	Spirometry	SEMA*, AT-104, CS-200
ERGO05	Ergo-spirometry	SEMA*, AT-104, CS-200
EKG02	Resting rhythm	SEMA*, AT-104, CS-200
EKG03	Late potential ECG	SEMA*, AT-104*, CS-200
EKG04	Holter (long term) ECG	MT-200
BDM01	Ambulatory (long term) Blood Pressure	MT-300

\*) Not applicable for 6302 "Request new examination" messages

## 3.2 Sample Use Cases

### 3.2.1 Unsolicited Transmission of Examination Data

An examination is performed on the device, and the EMR system is notified with the entered patient demographics and examination results.



*This use case is implemented in both the SDS and the MT software.*

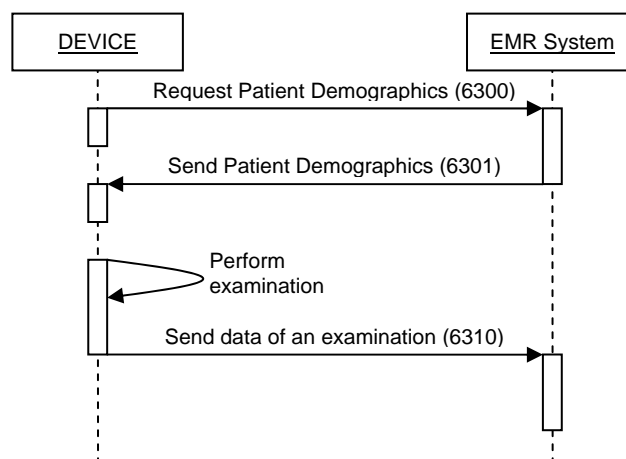
*In CS-200 and AT-104, the 6310 message can be automatically transmitted directly after acquisition, and in all SDS software (incl. SEMA) the 6310 message can be automatically transmitted after validation.*

*The transmission of a 6310 message from all SDS software can also be triggered after reception of an RST file via SEMACOMM or SCS. (Requires Semalmport v2.0 and a locally installed and configured installation of CS-200, AT-104 or SEMA.)*

*In MT-200 and MT-300 the 6310 message is transmitted manually by the user after selecting "Save recording (GDT)".*

### 3.2.2 Device Requests Patient Demographics and Transmits Examination Data

An examination is initiated on the device, which then asks the EMR system for patient demographics before the examination is performed. After acquisition, the EMR system is notified with the examination results.

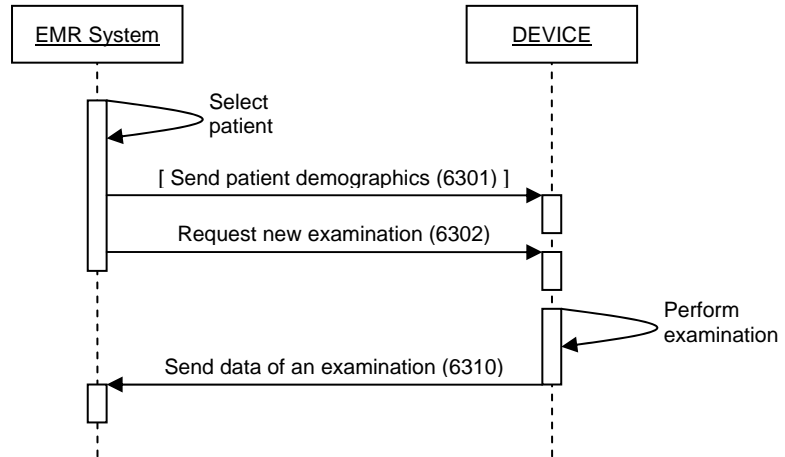


*This use case is only implemented in the MT-200 and MT-300.*

*The 6300 message is transmitted manually by the user after selecting "New recording (GDT)". The 6310 message is transmitted manually by the user after selecting "Save recording (GDT)".*

### 3.2.3 EMR System Requests New Examination

A request for an examination is initiated on the EMR system, which sends the patient demographics and which type of examination to perform to the device. After the examination has been performed on the device, the EMR system is notified with the examination results.



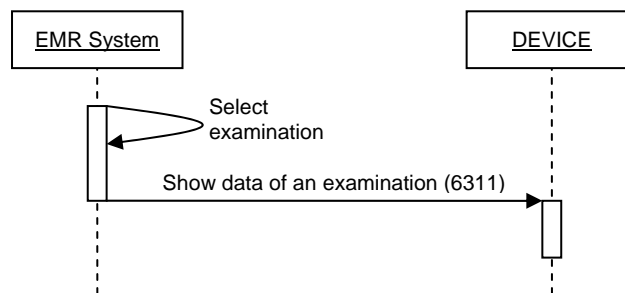
*This use case is only implemented in the AT-104, CS-200, and SEMA software. (The 6301 message is optional as the same information is present in the 6302 message.)*

*The AT-104, CS-200, and SEMA software detects the incoming 6301 and 6302 messages at start-up, when the user returns to the initial search screen in the applications, and when the initial search screen is active and the application is brought into focus by Windows.*

*The 6310 message can be automatically transmitted by the AT-104 and CS-200 after acquisition, and/or automatically by all SDS/SEMA software after validation.*

### 3.2.4 EMR System Requests an Examination to be Displayed

The EMR system has a record of a performed examination and requests that the device opens and displays that examination.



*This use case is only implemented in the AT-104, CS-200, and SEMA software.*

*The AT-104, CS-200, and SEMA software detects the incoming 6311 message at start-up, when the user returns to the initial search screen in the applications, and when the initial search screen is active and the application is brought into focus by Windows.*

## 3.3 Request Patient Demographics (6300)

SCHILLER devices and systems transmit the following fields:

ID	Description	Type	Remarks	SDS	MT
8000	Identification of record type		Always: "6300"		✓
8100	Length of record				✓
8315	GDT-ID of receiver				
8316	GDT-ID of sender				
9218	GDT version		Always: "01.00"		✓
3000	Patient number / ID		A value of 0 can be sent in order to request patient data of the current patient		✓

## 3.4 Send Patient Demographics (6301)

SCHILLER devices and systems recognize the following fields:

ID	Description	Type	Remarks	SDS	MT
8000	Identification of record type		Always: "6301"	✓	✓
8100	Length of record			✓	✓
8315	GDT-ID of receiver			✓	
8316	GDT-ID of sender			✓	
9218	GDT version		Always: "01.00"	✓	✓
3000	Patient number / ID			✓	✓
3101	Patient's last name			✓	✓
3102	Patient's first name			✓	✓
3103	Patient's birth date	'ddmmyyyy'		✓	✓
3110	Patient's gender	1=male; 2=female		✓	✓
3622	Patient's height	in cm		✓	✓
3623	Patient's weight	in kg		✓	✓
8402	Examination type		See comment below		✓

The MT-200 software requires the non-standard extension that an additional line with the label "Examination type" (8402) be added to the message being sent back as a reply to the "Request Patient Demographics" (6300) record. This has to contain the correct type "Holter (long term ECG)" (EKG04) otherwise an error will be reported.

The MT-300 software and future implementations of MT-200 does not have this non-standard extension.

### 3.4.1 Example "Import Patient Demographics"

```
01380006301 // 6301 - Transfer Patient Demographics
017300000324867 // Patient ID
0143101Meier // Patient Last name
0123102Urs // Patient first name
017310312091945 // Patient birth date = 12 Sept 1945
01031101 // Patient gender = 1 = male
0123622187 // Patient height = 187cm
011362388 // Patient weight = 88 kg
```

This creates a new patient in the database with

ID : 007  
 Last name : Meier  
 First name : Urs  
 Birth date : 12.09.1945  
 Gender : male  
 Height : 187cm  
 Weight : 88kg

## 3.5 Request New Examination (6302)

SCHILLER devices and systems recognize the following fields:

ID	Description	Type	Remarks	SDS	MT
8000	Identification of record type		Always "6302"	✓	
8100	Length of record			✓	
8315	GDT-ID of receiver			✓	
8316	GDT-ID of sender			✓	
9218	GDT version		Always: "01.00"	✓	
3000	Patient number / ID			✓	
3101	Patient's last name			✓	
3102	Patient's first name			✓	
3103	Patient's birth date	'ddmmyyyy'		✓	
3110	Patient's gender	1=male; 2=female		✓	
3622	Patient's height	in cm		✓	
3623	Patient's weight	in kg		✓	
8402	Examination type		See 3.1.2 above	✓	

### 3.5.1 Example "Request New Resting ECG"

```
00880006302 // record type 6302 - New examination
0073000007 // Patient ID = 007
0128402EKG01 // Examination type = Resting ECG
```

This means, that the Software checks, if a Patient with ID=007 exists, if is doesn't the patient is added to the database. It then switches to the Resting ECG acquisition mode.

## 3.6 Send Data of an Examination (6310)

SCHILLER devices and systems transmit the following fields:

ID	Description	Type	Remarks	SDS	MT
8000	Identification of record type		Always "6310"	✓	✓
8100	Length of record			✓	✓
8315	GDT-ID of receiver			✓	
8316	GDT-ID of sender			✓	
9218	GDT version		Always: "01.00"	✓	✓
3000	Patient number / ID			✓	✓
3101	Patient's last name			✓	✓
3102	Patient's first name			✓	✓
3103	Patient's birth date	'ddmmyyyy'		✓	✓
3110	Patient's gender	1=male; 2=female		✓	✓
3622	Patient's height	in cm		✓	✓
3623	Patient's weight	in kg		✓	✓
8432	Acquisition date	'ddmmyyyy'		✓	✓
8439	Acquisition time	'hhmmss'		✓	✓
8402	Examination type		See 3.1.2 above	✓	✓
6200	Storage date	'ddmmyyyy'	Normally same as 8432	✓	
6201	Storage time	'hhmmss'	Normally same as 8433	✓	
8470	Information related to the test		Name of an exported RST- or PDF-file	✓	
6220	Interpretation			✓	✓
6227	Comment		Indication, Medication, Risk factors (MT-300)		(✓)
6228	Preformatted results table		Must be displayed with mono space font		(✓)
8410	Test parameter ID		See comment below		✓
8411	Test parameter name		See comment below		✓
8420	Test parameter value		See comment below		✓
8421	Test parameter unit		See comment below		✓

### Measurement Values

If measurement values should be exported by the SEMA, AT-104, or CS-200, they will appear as additional 6220 "Interpretation" lines after the actual interpretation text. (Future implementations might use the 6228 "Preformatted results table" instead.)

The MT-300 software (and future MT-200 implementations) can export measurement values in the 6228 "Preformatted results table" or as reoccurring test parameter fields (8410 – 8421).

The test parameter fields (8410 – 8421) always appear as a group in the file which can appear multiple times. For detailed information about which test parameters that can be exported by the MT-200 software see 3.6.4 below, and by the MT-300 software see 3.6.5 below.

### 3.6.2 Example “Export of Resting ECG”

```

01380006310 // 6310 - Export examination
014810000459 // Length of record = 459 bytes
0138315EKG1 // Receiver GDT-ID
0138316SCH1 // Transmitter GDT-ID
014921801.00 // GDT version 1.00 (always)
022300019060922-7106 // Patient ID
0163101JANSSON // Patient Last Name
0203102HANNA SOFIA // Patient First Name
017310322091906 // Date of Birth = 22 Sept 1906
01031102 // Patient gender = female (2)
0123622163 // Patient height = 163 cm
011362357 // Patient weight = 57 kg
017843215062004 // Acquisition date = 15 June 2004
0158439084845 // Acquisition time = 08:48:45
0148402EKG01 // Examination type = Resting ECG
017620015062004 // Storage date = 15 June 2004
0218470EKG1F001.PDF // Attached file = EKG1F001.PDF
0236220 Sinus rhythm // Interpretation text
0186220Intervals // Measurement Values
0146220HR 78 // ...
0156220RR 767
0136220P 92
0156220PQ 166
0156220QRS 98
0156220QT 390
0166220QTc 445
0136220Axis
0136220P 28
0156220QRS 45
0136220T 43
    
```

### 3.6.3 Example “Export of Stress ECG”

```

01380006310 // Add comments...
014810000546
0138315EKG1
0138316SCH1
014921801.00
01330001000
0163101STEINER
0153102RUDOLF
017310316031940
01031101
0123622180
011362389
017843229032004
0158439145824
0158402ERGO01
017620029032004
0218470EKG0F001.RST
0536220Patient reaches exercise limit at 50 W only
0386220Max Heartrate: 60 / 43% / 140
0266220Max load: / % /
0236220Max BP: -- / -
0286220Pre Exercise HR: 60
0316220Pre Exercise BP: 0 / 0
0246220Work time: 4:00
0286220Recovery time: 1:03
0256220Total time: 5:33
0226220Break Reasons
    
```

### 3.6.4 Export Parameters in MT-200

The exported test parameter names (GDT field 8410) in the MT-200 are hard coded in German, regardless of the language of the software, and must be translated by the receiving EMR System according to the following table:

Export option	English Name	German Name (8410)	Example Value (8420)	Unit (8421)
<b>Duration of recording</b>	Duration of Recording	Aufnahmedauer	23:00	HH:MM
<b>Number of QRS</b>	Total QRS	Total QRS	98921	
<b>HF</b>	Minimum HR	Min. HF	31	/min
	Average HR	Durchschnitt HF	71	/min
	Maximum HR	Max. HF	115	/min
	Minimum RR	Min. RR	216	ms
	Maximum RR	Max. RR	4232	ms
	Minimum Sinus HR	Min. Sinus HF	51	/min
	Maximum Sinus HR	Max. Sinus HF	110	/min
<b>Rhythm Events</b>	Number of Bradycardias	Anzahl Bradykardien	3	
	Longest Bradycardia	Laengste Bradykardie	00:08:03	HH:MM:SS
	Number of Tachycardias	Anzahl Tachykardien	5	
	Longest Tachycardia	Laengste Tachykardie	00:07:45	HH:MM:SS
<b>PVC Events</b>	Number of Pauses	Anzahl Pausen	1	
	Number of PVC	Anzahl VES	4279	
	Number of Couplets	Anzahl Couplet	10	
	Number of Triplets	Anzahl Triplets	2	
	Number of VTachycardias	Anzahl VTachykardien	0	
	Number of Bigemenis	Anzahl Bigemenien	0	
<b>PAC &amp; Abs. Arrhythmias</b>	Number of Trigemenis	Anzahl Trigemenien	0	
	Number of PAC	Anzahl SVES	109	
	Number of SVTachycardias	Anzahl SVTachykardien	1	
	Number of Abs. Arrhythmias	Anzahl Abs. Arrhy.	0	



### 3.6.5 Export Parameters in MT-300

The exported test parameter names (GDT field 8411) in the MT-300 are dependent on the language of the installed software. The following table represents the English names of the parameter IDs (GDT field 8410):

Export option	ID (8410)	Name (8411)	Example Value (8420)	Unit (8421)
<b>Duration of recording and</b>	RECDUR	Duration of Recording	24:00	HH:MM
<b>Number of Measurements</b>	MEASTOT	Valid Measurements (Total)	71	
	ALLMEAS	All performed Measurements (Total)	60	
	MEASACT	Valid Measurements (Active Period)	63	
	MEASRST	Valid Measurements (Resting Period)	8	
<b>BP Statistics Total</b>	MINSTOT	Minimum Systole (Total)	108	mmHg
	AVGSTOT	Average Systole (Total)	136	mmHg
	MAXSTOT	Maximum Systole (Total)	165	mmHg
	STDSTOT	StdDev Systole (Total)	11.8	mmHg
	MINDTOT	Minimum Diastole (Total)	51	mmHg
	AVEDTOT	Average Diastole (Total)	79	mmHg
	MAXDTOT	Maximum Diastole (Total)	108	mmHg
	STDDTOT	StdDev Diastole (Total)	9.5	mmHg
	MINMTOT	Minimum MAP (Total)	77	mmHg
	AVEMTOT	Average MAP (Total)	98	mmHg
	MAXMTOT	Maximum MAP (Total)	126	mmHg
	STDMTOT	StdDev MAP (Total)	9.3	mmHg
	MINHRTOT	Minimum HR (Total)	55	bpm
	AVEHRTOT	Average HR (Total)	77	bpm
	MAXHRTOT	Maximum HR (Total)	118	bpm
	STDHRTOT	StdDev HR (Total)	13.2	bpm
	BPAMPTOT	BP Amplitude (Total)	57	mmHg
<b>BP Statistics Active Period</b>	MINSACT	Minimum Systole (Active Period)	110	mmHg
	AVGSACT	Average Systole (Active Period)	138	mmHg
	MAXSACT	Maximum Systole (Active Period)	165	mmHg
	STDSACT	StdDev Systole (Active Period)	9.9	mmHg
	MINDACT	Minimum Diastole (Active Period)	51	mmHg
	AVEDACT	Average Diastole (Active Period)	81	mmHg
	MAXDACT	Maximum Diastole (Active Period)	108	mmHg
	STDDACT	StdDev Diastole (Active Period)	9.1	mmHg
	MINMACT	Minimum MAP (Active Period)	77	mmHg
	AVEMACT	Average MAP (Active Period)	100	mmHg
	MAXMACT	Maximum MAP (Active Period)	126	mmHg
	STDMACT	StdDev MAP (Active Phase)	8.4	mmHg
	MINHRACT	Minimum HR (Active Period)	55	bpm
	AVEHRACT	Average HR (Active Period)	79	bpm
	MAXHRACT	Maximum HR (Active Period)	118	bpm
	STDHRACT	StdDev HR (Active Period)	12.2	bpm
	BPAMPACT	BP Amplitude (Active Period)	57	mmHg
<b>BP Statistics Resting Period</b>	MINSRST	Minimum Systole (Resting Period)	108	mmHg

Export option	ID (8410)	Name (8411)	Example Value (8420)	Unit (8421)
	AVGSRST	Average Systole (Resting Period)	118	mmHg
	MAXSRST	Maximum Systole (Resting Period)	141	mmHg
	STDSRST	StdDev Systole (Resting Period)	10.9	mmHg
	MINDRST	Minimum Diastole (Resting Period)	63	mmHg
	AVEDRST	Average Diastole (Resting Period)	68	mmHg
	MAXDRST	Maximum Diastole (Resting Period)	74	mmHg
	STDDRST	StdDev Diastole (Resting Period)	3.9	mmHg
	MINMRST	Minimum MAP (Resting Period)	80	mmHg
	AVEMRST	Average MAP (Resting Period)	86	mmHg
	MAXMRST	Maximum MAP (Resting Period)	96	mmHg
	STDMRST	StdDev MAP (Resting Period)	5.1	mmHg
	MINHRRST	Minimum HR (Resting Period)	55	bpm
	AVEHRRST	Average HR (Resting Period)	61	bpm
	MAXHRRST	Maximum HR (Resting Period)	77	bpm
	STDHRRST	StdDev HR (Resting Period)	9.9	bpm
	BPAMPRST	BP Amplitude (Resting Period)	50	mmHg
<b>Day Night Decay</b>	DNDS1	Day Night Decay Systole Day 1	12	%
	DNDD1	Day Night Decay Diastole Day 1	15	%
	DNDHR1	Day Night Decay HR Day 1	17	%
	DNDS2	Day Night Decay Systole Day 2	17	%
	DNDD2	Day Night Decay Diastole Day 2	15	%
	DNDHR2	Day Night Decay HR Day 2	26	%
<b>WHO/BHS Classification</b>	CLASS	Classification	High Normal/ Borderline	
<b>Limit Exceedance</b>	LIMSACT	Limit Systole (Active Period)	160	mmHg
	EXSACT	Limit Exceedance Systole (Active Period)	2	
	LIMDACT	Limit Diastole (Active Period)	90	mmHg
	EXDACT	Limit Exceedance Diastole (Active Period)	7	
	LIMHRACT	Limit HR (Active Period)	100	bpm
	EXHRACT	Limit Exceedance HR (Active Period)	4	
	LIMSRST	Limit Systole (Resting Period)	140	mmHg
	EXSRST	Limit Exceedance Systole (Resting Period)	1	
	LIMDRST	Limit Diastole (Resting Period)	80	mmHg
	EXDRST	Limit Exceedance Diastole (Resting Period)	0	
	LIMHRRST	Limit HR (Resting Period)	80	bpm
	EXHRRST	Limit Exceedance HR (Resting Period)	0	
<b>Base Value</b>	BASEVALS	Base Value Systole (first measurement)	139	mmHg
	BASEVALD	Base Value Diastole (first measurement)	83	mmHg

## 3.7 Show Data of an Examination (6311)

SCHILLER devices and systems recognize the following fields:

ID	Description	Type	Remarks	SDS	MT
8000	Identification of record type		Always "6311"	✓	
8100	Length of record			✓	
8315	GDT-ID of receiver			✓	
8316	GDT-ID of sender			✓	
9218	GDT version		Always: "01.00"	✓	
3000	Patient number / ID			✓	
3101	Patient's last name			✓	
3102	Patient's first name			✓	
3103	Patient's birth date	'ddmmyyyy'		✓	
3110	Patient's gender	1=male; 2=female		✓	
3622	Patient's height	in cm		✓	
3623	Patient's weight	in kg		✓	
8432	Examination date	'ddmmyyyy'		✓	
8439	Examination time	'hhmmss'		✓	
8402	Examination type		See 3.1.2 above	✓	

### 3.7.1 Example "Show Examination"

```
00880006311 // Record Type 6311 - Show examination
0073000007 // Patient ID = 007
012843216032005 // Examination date = 16.03.2005
0108439170453 // Examination time = 17:04:53
```

This means, that the Software checks, if a Patient with ID=007 exists, this patient an examination with date 16.03.2005 and time 17:04:53 has and then opens this examination.

## 4 ADIS Export Format

The ADIS Export Format is a non-standard extended version of the GDT interface, with added exported measurements and waveform data for Resting ECG, Exercise ECG, Spirometry and the ECG part of Ergo-Spirometry.

When the ADIS export handler is configured, the 6310 "Send data of an examination" message defined under 3.6 above, will be replaced by the messages defined in this section. Furthermore, no simultaneous export (and attachment) of PDF or RST files are possible.

### 4.1 Resting ECG

SEMA, AT-104, and CS-200 export the following information of a Resting ECG ("EKG01") examination:

ID	Description	Type	Remarks	SDS	MT
8000	Identification of record type		Always "6310"	✓	
8100	Length of record		Not used, always "00000"	✓	
8315	GDT-ID of receiver			✓	
8316	GDT-ID of sender			✓	
3000	Patient number / ID			✓	
3101	Patient's last name			✓	
3102	Patient's first name			✓	
3103	Patient's birth date	'ddmmyyyy'		✓	
3110	Patient's gender	1=male; 2=female		✓	
3622	Patient's height	in cm		✓	
3623	Patient's weight	in kg		✓	
8402	Examination type		Always "EKG01" (see 3.1.2 above)	✓	
6200	Storage date	'ddmmyyyy'	Acquisition date	✓	
6201	Storage time	'hhmmss'	Acquisition time	✓	
6220	Interpretation	(recurring)		✓	
9010	Heart Rate	bpm	<b>Start of global measurements</b>	✓	
9011	Systolic Blood Pressure	mmHg		✓	
9012	Diastolic Blood Pressure	mmHg		✓	
9020	QRS Interval	ms		✓	
9021	QT Interval	ms		✓	
9022	QTC Interval	ms		✓	
9023	PQ Interval	ms		✓	
9025	RR Interval	ms		✓	
9026	P Interval	ms		✓	
9030	QRS Axis	degrees		✓	
9031	T Axis	degrees		✓	
9032	P Axis	degrees		✓	
9200	Lead ID		<b>Start of recurring lead group</b>	✓	
9221	Q-Interval	ms		✓	
9222	R-Interval	ms		✓	
9223	S-Interval	ms		✓	

ID	Description	Type	Remarks	SDS	MT
9224	R'-Interval	ms		✓	
9225	S'-Interval	ms		✓	
9230	P-Amplitude	µV		✓	
9231	Q-Amplitude	µV		✓	
9232	R-Amplitude	µV		✓	
9233	S-Amplitude	µV		✓	
9234	R'-Amplitude	µV		✓	
9235	S'-Amplitude	µV		✓	
9240	J-Amplitude	µV		✓	
9241	ST-Amplitude	µV		✓	
9242	T-Amplitude	µV		✓	
9260	P-Onset	ms		✓	
9261	P-Offset	ms		✓	
9262	QRS-Onset	ms		✓	
9263	QRS-Offset	ms		✓	
9264	T-Offset	ms		✓	
9300	Rhythm Sample Rate	Hz		✓	
9309	Rhythm Sample Count			✓	
9310	Rhythm Sample Unit		Always 'µV'	✓	
9311	Rhythm Samples	µV (recurring)	Comma separated uncompressed samples	✓	
9350	Average Beat Sample Rate	Hz		✓	
9359	Average Beat Sample Count			✓	
9360	Average Beat Sample Unit		Always 'µV'	✓	
9361	Average Beat Samples	µV (recurring)	Comma separated uncompressed samples	✓	

The lead group (9200 – 9361) will be repeated for each of the individual leads in the Resting ECG recording. Both the rhythm (9300 – 9311) and average beat (9350 – 9361) waveform data is exported as uncompressed, comma separated samples, written as recurring 9311 and 9361 fields with a maximum length of 80 characters each.

## 4.2 Exercise ECG and Ergo-Spirometry

SEMA, AT-104, and CS-200 export the following information of an Exercise ECG ("ERGO01") or Ergo-Spirometry ("ERGO05") examination:

*Please note that the ADIS export for Ergo-Spirometry mentioned here, is only available in versions 2.43 and later of the aforementioned applications.*

ID	Description	Type	Remarks	SDS	MT
8000	Identification of record type		Always "6310"	✓	
8100	Length of record		Not used, always "00000"	✓	
8315	GDT-ID of receiver			✓	
8316	GDT-ID of sender			✓	
3000	Patient number / ID			✓	
3101	Patient's last name			✓	
3102	Patient's first name			✓	
3103	Patient's birth date	'ddmmyyyy'		✓	
3110	Patient's gender	1=male; 2=female		✓	
3622	Patient's height	in cm		✓	
3623	Patient's weight	in kg		✓	
8402	Examination type		Either "ERGO01" or "ERGO05" (see 3.1.2 above)	✓	
6200	Storage date	'ddmmyyyy'	Acquisition date	✓	
6201	Storage time	'hhmmss'	Acquisition time	✓	
6220	Interpretation	(recurring)			
9100	Stage Type	0=resting; 1=stress; 2=recovery	<b>Start of recurring stage group</b>	✓	
9101	Stage Number		Incrementing	✓	
9110	Stage Start	'hhmmss'		✓	
9111	Stage Load	W		✓	
9120	Heart Rate	bpm		✓	
9121	Systolic Blood Pressure	mmHg		✓	
9122	Diastolic Blood Pressure	mmHg		✓	
9200	Lead ID		<b>Start of embedded recurring lead group</b>	✓	
9210	IsoElectric Line	µV		✓	
9260	P-Onset	ms		✓	
9261	P-Offset	ms		✓	
9262	QRS-Onset	ms		✓	
9263	QRS-Offset	ms		✓	
9264	T-Offset	ms		✓	
9350	Average Beat Sample Rate	Hz		✓	
9359	Average Beat Sample Count			✓	
9360	Average Beat Sample Unit		Always 'µV'	✓	
9361	Average Beat Samples	µV (recurring)	Comma separated uncompressed samples	✓	

The stage group (9100 – 9361) will be repeated for each of the individual stages in the Exercise ECG recording. In each stage group, the embedded lead group (9200 – 9361) will be repeated for each of the individual leads where the average beat (9350 – 9361) waveform data is exported as uncompressed, comma separated

samples, written as recurring 9361 fields with a maximum length of 80 characters each.

## 4.3 Spirometry

SEMA, AT-104, and CS-200 export the following information of a Spirometry ("LUFU00") examination:

ID	Description	Type	Remarks	SDS	MT
8000	Identification of record type		Always "6310"	✓	
8100	Length of record		Not used, always "00000"	✓	
8315	GDT-ID of receiver			✓	
8316	GDT-ID of sender			✓	
3000	Patient number / ID			✓	
3101	Patient's last name			✓	
3102	Patient's first name			✓	
3103	Patient's birth date	'ddmmyyyy'		✓	
3110	Patient's gender	1=male; 2=female		✓	
3622	Patient's height	in cm		✓	
3623	Patient's weight	in kg		✓	
8402	Examination type		Always "LUFU00" (see 3.1.2 above)	✓	
6200	Storage date	'ddmmyyyy'	Acquisition date	✓	
6201	Storage time	'hhmmss'	Acquisition time	✓	
6220	Interpretation	(recurring)		✓	
9900	Spirometry Data Available?	0=no; 1=yes		✓	
9901	Norm Value Type		See 4.3.1 below	✓	
9910	PRE FVC-Test Count		<b>Start of FVC-Test group</b>	✓	
9911	POST FVC-Test Count			✓	
9912	FVC Norm Values		See 4.3.2 below	✓	
9913	PRE FVC-Test Number	1-3	0=no test available	✓	
9914	PRE FVC Sample Rate	Hz		✓	
9915	PRE FVC Sample Unit		Always "ml/sample"	✓	
9916	PRE FVC Measured Values		See 4.3.2 below	✓	
9917	PRE FVC Samples	ml/sample (recurring)	Comma separated uncompressed samples	✓	
9918	POST FVC-Test Number	1-3	0=no test available	✓	
9919	POST FVC Sample Rate	Hz		✓	
9920	POST FVC Sample Unit		Always "ml/sample"	✓	
9921	POST FVC Measured Values		See 4.3.2 below	✓	
9922	POST FVC Samples	ml/sample (recurring)	Comma separated uncompressed samples	✓	
9923	PRE SVC-Test Count		<b>Start of SVC-Test group</b>	✓	
9924	POST SVC-Test Count			✓	
9925	SVC Norm Values		See 4.3.3 below	✓	
9926	PRE SVC-Test Number	1-3	0=no test available	✓	
9927	PRE SVC Sample Rate	Hz		✓	
9928	PRE SVC Sample Unit		Always "ml"	✓	
9929	PRE SVC Measured Values		See 4.3.3 below	✓	
9930	PRE SVC Samples	ml (recurring)	Comma separated uncompressed samples	✓	
9931	POST SVC-Test Number	1-3	0=no test available	✓	

ID	Description	Type	Remarks	SDS	MT
9932	POST SVC Sample Rate	Hz		✓	
9933	POST SVC Sample Unit		Always "ml"	✓	
9934	POST SVC Measured Values		See 4.3.3 below	✓	
9935	POST SVC Samples	ml ( <i>recurring</i> )	Comma separated uncompressed samples	✓	
9936	PRE MVV-Test Count		<b>Start of MVV-Test group</b>	✓	
9937	POST MVV-Test Count			✓	
9938	MVV Norm Values		See 4.3.4 below	✓	
9939	PRE MVV-Test Number	1-3	0=no test available	✓	
9940	PRE MVV Sample Rate	Hz		✓	
9941	PRE MVV Sample Unit		Always "ml"	✓	
9942	PRE MVV Measured Values		See 4.3.4 below	✓	
9943	PRE MVV Samples	ml ( <i>recurring</i> )	Comma separated uncompressed samples	✓	
9944	POST MVV-Test Number	1-3	0=no test available	✓	
9945	POST MVV Sample Rate	Hz		✓	
9946	POST MVV Sample Unit		Always "ml"	✓	
9947	POST MVV Measured Values		See 4.3.4 below	✓	
9948	POST MVV Samples	ml ( <i>recurring</i> )	Comma separated uncompressed samples	✓	
9949	PRE MV-Test Count		<b>Start of MV-Test group</b>	✓	
9950	POST MV-Test Count			✓	
9951	MV Norm Values		See 4.3.5 below	✓	
9952	PRE MV-Test Number	1-3	0=no test available	✓	
9953	PRE MV Sample Rate	Hz		✓	
9954	PRE MV Sample Unit		Always "ml"	✓	
9955	PRE MV Measured Values		See 4.3.5 below	✓	
9956	PRE MV Samples	ml ( <i>recurring</i> )	Comma separated uncompressed samples	✓	
9957	POST MV-Test Number	1-3	0=no test available	✓	
9958	POST MV Sample Rate	Hz		✓	
9959	POST MV Sample Unit		Always "ml"	✓	
9960	POST MV Measured Values		See 4.3.5 below	✓	
9961	POST MV Samples	ml ( <i>recurring</i> )	Comma separated uncompressed samples	✓	

Depending on the type of test(s) performed, the FVC, SVC, MVV, and MV test groups may or may not be present. If they are present, the respective PRE and POST test subgroups will occur 1 to 3 times in the file, depending on the number of PRE or POST tests performed.

In each test subgroup, the waveform data is exported as uncompressed, comma separated samples, written as recurring fields with a maximum length of 80 characters each.

The values of the exported FVC waveform data are stored as the flow values in ml/s. It is thereby possible to display the curves as V(f) (Volume-Time) or as f(V) (Flow-Volume; also "Loops"). To display loops, the flow values / 60 must be integrated.



### 4.3.1 Definition of Norm Value Types (9901)

The ADIS Spirometry record (6310) contain the field label 9901 "Norm Value Type" to identify the type of norm that is contained in the record.

Code	Norm Value Type
0	KNUDSON/ITS
1	KNUDSON76/ITS
2	CRAPO/ITS
3	MORRIS/ITS
4	POLGAR/ITS
5	COMPOSITE
6	ECCS/QUANJER
7	AUSTRIA
8	BERGLUND/QUANJER
9	FINLAND/QUANJER
10	INDIA

### 4.3.2 FVC Values

The FVC Norm Values (9912), PRE FVC Measured Values (9916), and POST FVC Measured Values (9921) are stored as a comma separated array of the following 20 decimal values (with a decimal point):

FVC, FEV0.5, FEV1.0, FEV3.0, FEV0.5/FVC, FEV1.0/FVC, FEV3.0/FVC, FEF0.2-1.2, FEF25-75%, FEF75-85%, PEF, MEF75%, MEF50%, MEF25%, FIVC, FIV1.0, FIV1.0/FIVC, FIV1.0/VC, PIF, and MIF50%

### 4.3.3 SVC Values

The SVC Norm Values (9925), PRE SVC Measured Values (9929), and POST SVC Measured Values (9934) are stored as a comma separated array of the following 4 decimal values (with a decimal point):

SVC, ERV, IRV, and TV

### 4.3.4 MVV Values

The MVV Norm Values (9938), PRE MVV Measured Values (9942), and POST MVV Measured Values (9947) are stored as a comma separated array of the following 3 decimal values (with a decimal point):

MVV, RR, and TV

### 4.3.5 MV Values

The MV Norm Values (9951), PRE MV Measured Values (9955), and POST MV Measured Values (9960) are stored as a comma separated array of the following 3 decimal values (with a decimal point):

MV, RR, and TV

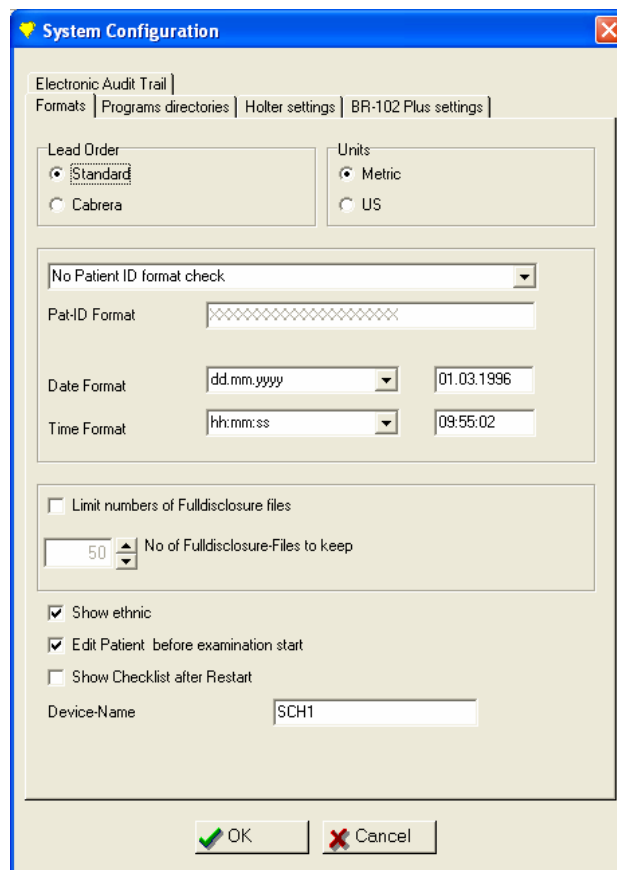
# 5 Software Configuration

## 5.1 SEMA, AT-104, and CS-200

### 5.1.1 Defining the GDT ID

- ⇒ Start the SCHILLER Software
- ⇒ Open the *Formats* settings in the *System Configuration* dialog

  1. Click on the *Settings* menu
  2. Choose *System Configuration ...*
  3. Switch to the *Formats* tab



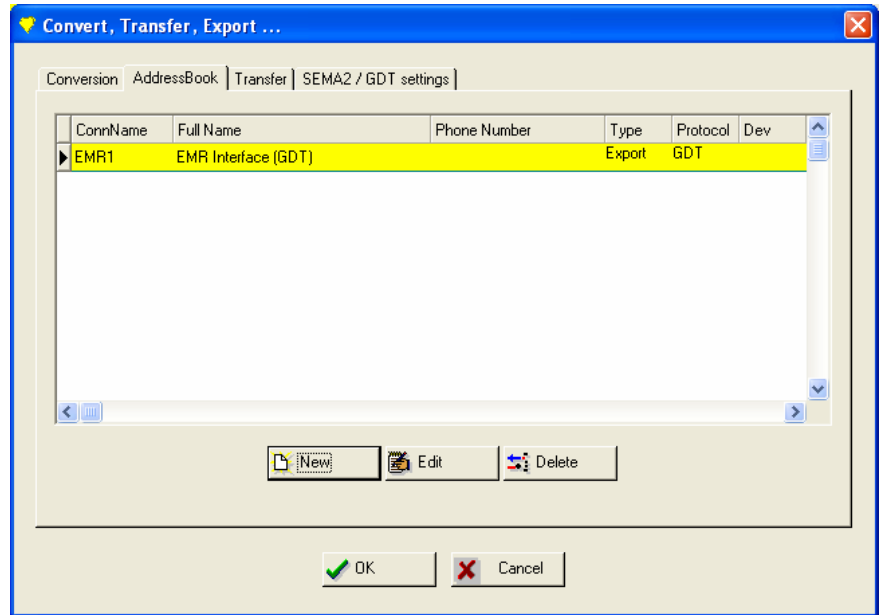
- ⇒ In the field *Device-Name*, type in the 4 character GDT-ID of this SCHILLER software (here it is "SCH1").

### 5.1.2 Enabling Export in GDT Format

- ⇒ Start the SCHILLER Software.
- ⇒ Open the *Address Book* settings in the *Convert, Transfer, Export ...* dialog

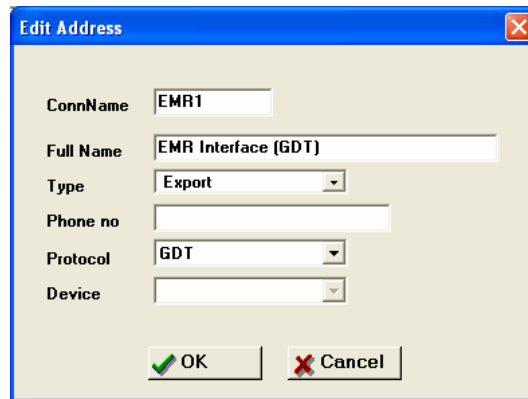
  1. Click on the *Settings* menu
  2. Choose *Convert, Transfer, Export ...*

3. Switch to the *Address Book* tab



⇒ Define an Export Handler with the GDT Export Format.

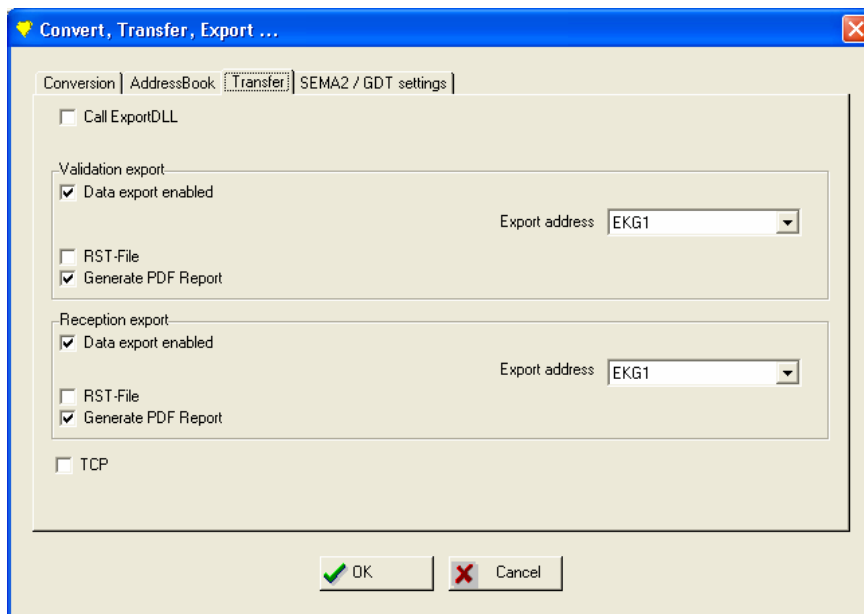
1. Click "New"



2. In the field *ConnName*, type in the GDT-ID of the EMR System (here it is "EMR1").
3. In the field *Full Name*, optionally type in a more human readable description of the interface (here it is "EMR Interface (GDT)").
4. In the field *Type*, choose the *Export* option
5. In the field *Protocol*, choose the *GDT* or *ADIS* option, depending on the type of interface you want to define (here it is "GDT").
6. Click *OK*

⇒ Configure the Export settings

1. Switch to the *Transfer* tab

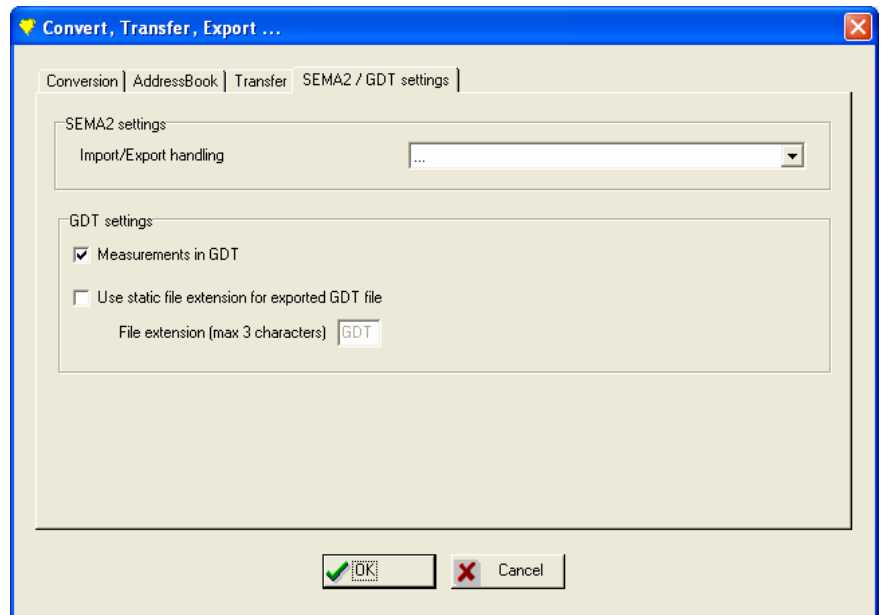


2. Depending on the software you are using, you can configure the automatic export of examinations after acquisition (AT-104 PC, CS-200) and/or after validation (AT-104 PC, CS-200 and SEMA).

- a. If you want to enable automatic export after validation, select the *Data export enabled* in the *Validation export* group.
  - b. If you want to enable automatic export after acquisition, select the *Data export enabled* in the *Reception export* group.
3. Select the appropriate *Export address* for each of the export options that you enabled. (Note: These are the Export handlers that you defined above. More than one export handler can be setup, but only one can be used at a time.)
4. If you want to simultaneously export an RST-file or (depending on the software you are using) a PDF-file, select one of the *RST-File* or *Generate PDF Report* options for each of the export options that you enabled. (Note: For ADIS export, no additional RST or PDF export is possible.)

⇒ If you are using GDT, configure the GDT export options

1. Switch to the *SEMA / GDT settings* tab



2. If you want to include Measurement Values in the exported GDT 6310 messages, select the option *Measurement in GDT*.

3. If you want to use a static, non-incrementing file extension for exported GDT files, select the option *Use static file extension for exported GDT file* and type in the specific file extension to use in the *File extension (max. 3 characters)* field (here it is "GDT"). (Note: By not selecting this option, incrementing file extensions will be used.)

*Please note that these GDT options are not valid for ADIS export. In ADIS, the measurement values are always included in the separate fields of the message (see 4 above). Furthermore, exported ADIS messages always use incrementing file extensions.*

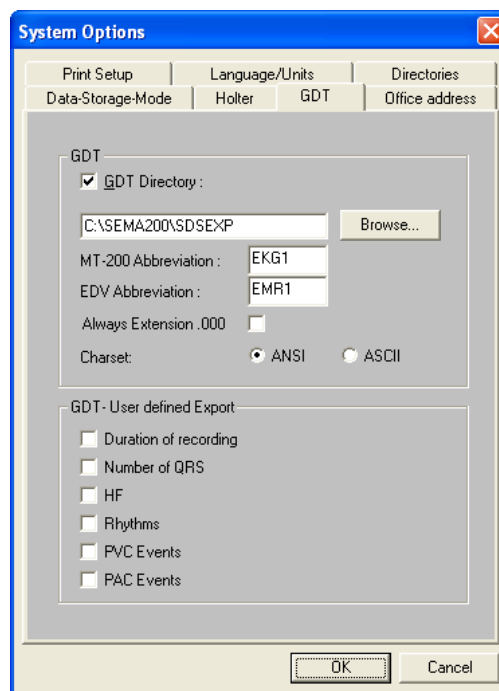
⇒ Save the settings by clicking OK.

For more information, please refer to the user manual of the SCHILLER Software you are using.

## 5.2 MT-200

### 5.2.1 Enabling Export in GDT Format

- ⇒ Start the MT-200 software
- ⇒ Open the *GDT* settings in the *System Options* dialog
  1. Click on the *Options* menu
  2. Choose *System...*
  3. Switch to the *GDT* tab



- ⇒ Activate the GDT export by clicking on *GDT Directory* until a checkmark appears to the left.
- ⇒ Type in or *Browse...* for the directory which will be used to store the GDT communication files.
- ⇒ In the field *MT-200 Abbreviation*, type in the GDT ID of this SCHILLER software (here it is “EKG1”).
- ⇒ In the field *EDV Abbreviation* (EDV = EMR), type in the GDT ID of the EMR System (here it is “EMR1”).
- ⇒ If the EMR System supports a fixed filename only, click on *Always Extension .000* until a checkmark appears on the right. If the EMR System supports incrementing file extensions, leave the checkbox empty. (Consult your EMR System user manual for more information on which file mode to use.)
- ⇒ Select the character set to be used in the GDT communication files by selecting either *ANSI* or *ASCII*. (Consult your EMR System user manual for more information on which character set to use.)
- ⇒ Finally select one or more of the *User defined Export* items to export additional test parameters. (For more information on which parameters that will be exported, see 3.6.4 above.)

Now a "Send Data of an Examination" (6310) record will be exported when you click *Save Recording (GDT)* in the MT-200.

For more information about working with GDT files, please consult the user manual for MT-200.

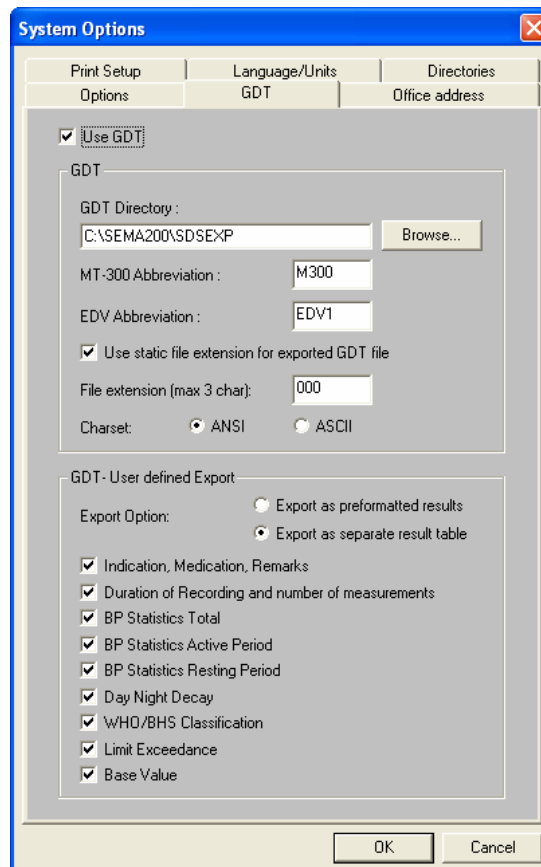
## 5.3 MT-300

### 5.3.1 Enabling Export in GDT Format

⇒ Start the MT-200 or MT-300 software

⇒ Open the *GDT* settings in the *System Options* dialog

1. Click on the *Options* menu
2. Choose *System...*
3. Switch to the *GDT* tab



⇒ Activate the GDT export by clicking on *Use GDT* until a checkmark appears to the left.

⇒ Type in or *Browse...* for the directory which will be used to store the GDT communication files.

⇒ In the field *MT-300 Abbreviation*, type in the GDT ID of this SCHILLER software (here it is "M300").

⇒ In the field *EDV Abbreviation* (EDV = EMR), type in the GDT ID of the EMR System (here it is "EDV1").

- ⇒ If the EMR System supports a fixed filename only, click on *Use static file extension for exported GDT file* until a checkmark appears on the right, and enter the static file extension to use in the *File extension (max. 3 char)* field. If the EMR System supports incrementing file extensions, leave the checkbox empty. (Consult your EMR System user manual for more information on which file mode to use.)
- ⇒ Select the character set to be used in the GDT communication files by selecting either *ANSI* or *ASCII*. (Consult your EMR System user manual for more information on which character set to use.)
- ⇒ Select the export option for the *User defined Export*. The *User defined Export* items can be *exported as preformatted results* (GDT fields 6228) or *exported as separate results table* (GDT fields 8410-8421) if the EMR System supports this functionality.
- ⇒ Finally select one or more of the *User defined Export* items to export additional test parameters. (For more information on which parameters that will be exported, see 3.6.5 above.)

Now a "Send Data of an Examination" (6310) record will be exported when you click Save Recording (GDT) in the MT-300.

For more information about working with GDT files, please consult the user manual for MT-300.



## 5.4 SemalImport

The GDT Export in SemalImport requires SemalImport v2.0 or later, and a fully configured installation of SEMA, AT-104, or CS-200 to be installed on the same PC as SemalImport.

### 5.4.1 Enabling GDT Export after Reception

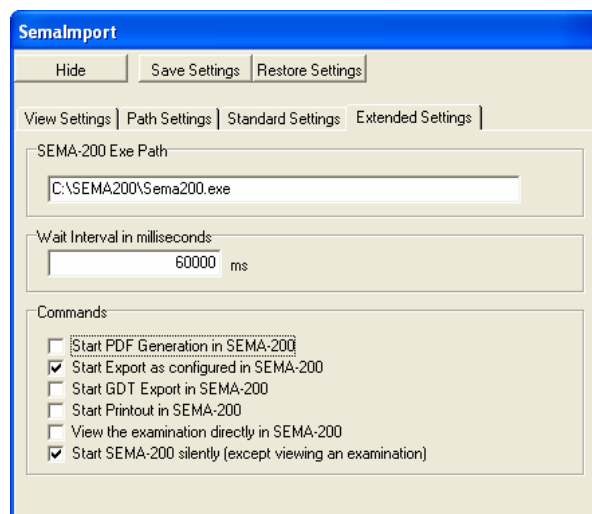
⇒ Configure a locally installed (meaning on the same PC as SemalImport) SEMA, AT-104 or CS-200 GDT export according to section 5.1 above.

⇒ Open the SemalImport *Control Panel*

1. Right click on the SemalImport icon in the system tray of Windows

2. Choose *Control Panel*

⇒ Switch to the *Extended Settings* tab



⇒ Enter the path to the SEMA, AT-104 or CS-200 executable into *SEMA-200 Exe Path*

⇒ Select the *Start Export as configured in SEMA-200* option. (Note: Please ignore the *Start GDT Export in SEMA-200* if this option is available and make sure that it is unchecked.)

⇒ If you do not want SEMA-200 to show the main application window during export, please check the *Start SEMA-200 silently* option. (Note: This option is only available in SEMA, not AT-104 and CS-200.)

⇒ Click *Save Settings*.

⇒ Click *Hide* to close the SemalImport *Control Panel*

SemalImport will now wait for RST files in the Import directory, insert the files into the database, and call the configured export handler in SEMA, AT-104 or CS-200. After the export is finished, SEMA, AT-104 or CS-200 will close.

### 5.4.2 Defining Username and Password

If the SemalImport export handler calling is used in an environment with electronic audit trails enabled, a specific username and password should be defined in the SemalImport.ini configuration file. The specified user must have Export user rights enabled in the AT-104, CS-200, or SEMA installation which is called by SemalImport.