Diasensor 2000 User Card Format Specification

Table of Contents

1 General Description

This specification defines the data format of the Diasensor 2000 User Card (It is equivalent to the Diasensor 1000 User Skin Library Card Format Specification 30683-MS01.) It defines the internal memory organization in terms of data field names, sizes, offsets, and numeric ranges within the card. The actual numeric values programmed into the data fields are specific to the particular user and Diasensor 2000 configuration.

2 References

31184-FS02 Diasensor 2000 Spectrum Data Structure Format Specification
31184-FS03 Diasensor 2000 Machine Data Format Specification
31184-FS04 Diasensor 2000 Telemedicine Data Format Specification

3 Specifications

3.1 User Card Organization

Table 1 describes the top-level layout of the User Card.

The user card (PCMCIA) can viewed as eight 64K sectors (total size of the PCMCIA card is 512K). The first sector contains information pertaining to the user and Telemedicine parameters. Sectors 2 through 6 are reserved to store the readings computed by the Diasensor 2000. Sector 7 is used to store bias correction parameters and invasive HemoQue reading averages. Sector 8 is used for storing control counters.

The card is initially formatted by BICO with patient and telemedicine information in the first sector; empty bias correction information in sector seven, and counters in sector eight.

The USER_CARD structure contains parameters specific to a particular user and Diasensor 2000 instrument. This structure will be written once at BICO, read many times, and occasionally updated.

The array of MDM_READING structures will be written once by the Diasensor and read multiple times. It is used to store historical glucose measurement readings computed by the instrument. Five sectors of the user card flash memory are initially erased and the readings are appended contiguously using the MDM_READING structure.

The BIAS_CORRECT structure contains parameters used for on-line bias correction. This structure is intended to be modifiable by the instrument. It is re-written many times over the lifetime of the User Card.

The HEMO_AVG structure contains invasive HemoCue readings for running average. This structure is intended to be modifiable by the instrument. It is re-written many times over the lifetime of the User Card.

The CONTROL_COUNTERS data structure is initialized at BICO to the starting configuration for the patient. It will be updated by the Telemedicine link when the USER_CARD, BIAS_CORRECT, or CONTROL_COUNTERS structures are changed. The counters are updated each sitting by the instrument.

Offset is measured from the beginning of the User Card address space.

The number of sensors present and the number of sensors used are 10. Sensor 11, even though defined as a sensor in the structures, its not a sensor but is a stored value used for quality monitoring.

Table 1: User Card Organization

Offset (Bytes)	Structure Size (Bytes)	Structure	Description	Format Reference
0	28586	USER_CARD	User Card parameters	3.3.1
28586	570	TELEMED	Telemedicine phone, modem, and internet access information	3.3.20

Offset (Bytes)	Structure Size (Bytes)	Structure	Description	Format Reference
29156	36380	UNUSED SPACE		
65536 0x10000	327658	MDM_READING[7123]	contiguous array of 7123historical readings (46 bytes each) The MDM_READING structure crosses sector boundaries.	3.3.5
393194	22	UCHAR[0]	Filler at end of sector 5.	3.2
393216 0x60000	26	BIAS_CORRECT	modifiable bias correction parameters	3.3.17
0	290	HEMO_AVG	Stores invasive HemoCue readings for running average	3.3.18
458752 0x70000	36	CONTROL_COUNTERS	Patient control flags and counters	3.3.19

3.2 Basic Numeric Types

The following table lists the basic numeric types used within the User Card. Each parameter in the User Card is represented by one of these basic numeric types.

Type Name	Size (Bytes)	Description	Range
BOOL	1	Boolean	0 or 1
CHAR	1	Signed character	-128 to 127
DOUBLE	8	Double precision floating point number	Approx. 2.2E-308 to 1.8E308 (15-digit precision)
DWORD	4	Double precision signed integer	-2,147,483,648 to 2,147,483,647
INT	2	Signed integer	-32,768 to 32,767
UCHAR	1	Unsigned character	0 to 255
UDWORD	4	Double precision unsigned integer	0 to 4,294,967,295
UINT	2	Unsigned integer	0 to 65,535
UWORD	2	Unsigned integer	0 to 65,535

3.3 Data Structures

The following sections describe the data structures used in the User Card.

The USER_CARD, TELEMED, BIAS_CORRECT and CONTROL_COUNTERS structures will also be stored in 186 flash memory and the READING structure will be stored in Modem Card flash memory for night transfer. This is required since the User Card may not be in the unit at night (especially when there are several patients using a single unit.) The User Card will be updated when the card is inserted into the machine if new information for the patient was downloaded via the Telemedicine link from BICO. Similarly the 186 flash is updated when a new user card is received from BICO and inserted for the first time.

The User Card data is the source for input data for the Diasensor. The data stored in the Diasensor's internal memory is used only for night transfer of readings and downloading of change (e.g. User Card, Control Parameters) from BICO.

3.3.1 USER_CARD Format

Table 2 describes the format of the USER_CARD data structure.

Offset is measured from the beginning of the structure.

Total structure size is 28586 bytes.

Table 2: USER_CARD Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	2	UWORD	file_version	file format version in hex	0 to FFFF (hex)	3.2
2	2	UWORD	data_source	source of the data	1 = User Card 2 = Telemedicine	3.2
4	248	USER_ID	user	user/unit identification parameters	N/A	3.3.2
252	27330	SKIN_LIBRARY	slb	skin library parameters	N/A	3.3.3
27582	916	UCHAR[916]	fill	fill to allign CONFIG_DATA	N/A	3.2
28498	88	CONFIG_DATA	cfg	configuration parameters	N/A	3.3.4

3.3.2 USER_ID Format

Table 3 describes the format of the USER_ID data structure.
Offset is measured from the beginning of the structure.
CRC_16 is the total USER_CARD structure computed crc.
Total structure size is 248 bytes.

Table 3: USER_ID Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	216	UNIT_INFO	unit	D-2000 unit information	N/A	3.3.15
216	30	USER_INFO	curr_user	current user information	N/A	3.3.16
246	2	UWORD	crc_16	cyclic redundancy check for structure	0 to 65,535	3.2

3.3.3 SKIN_LIBRARY Format

Table 4 describes the format of the SKIN_LIBRARY data structure.
Offset is measured from the beginning of the structure.
Total structure size is 27330 bytes.

Table 4: SKIN_LIBRARY Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	4	DWORD	createDate	skin library information creation date in the form YYYYMMDD		3.2
4	2	UWORD	numSpectraChan	number of channels in spectra	0 to 64	3.2
6	2	UWORD	numOutlierRanks	number of ranks to be used for skin data outlier detection (in PLS loadings matrix)	0 to 45	3.2
8	2	UWORD	numSkinPredictRanks	number of ranks to be used for skin prediction	0 to 3	3.2
10	16	RANGE_ELEM	rangeSensors[1]	calibration range for sensor channel 1	N/A	3.3.12
26	16	RANGE_ELEM	rangeSensors[2]	calibration range for sensor channel 2	N/A	3.3.12
...	...	...	...	...	...	...
154	16	RANGE_ELEM	rangeSensors[10]	calibration range for sensor channel 10	N/A	3.3.12
170	16	RANGE_ELEM	rangeSensors[11]	This field has been redefined for storage of the quality monitoring acceptable difference. If loEndPoint is nonzero, then hiEndPoint contains the QM acceptable difference value.	N/A	3.3.12
186	8	DOUBLE	meanCalibSkinSpec[1]	mean skin from calibration in absorbance units for spectra channel 1	Usage specific	3.2
194	8	DOUBLE	meanCalibSkinSpec[2]	mean skin from calibration in absorbance units for spectra channel 2	Usage specific	3.2
...	...	...	...	...	...	...
690	8	DOUBLE	meanCalibSkinSpec[64]	mean skin from calibration in absorbance units for spectra channel 64	Usage specific	3.2
698	8	DOUBLE	leverTol	tolerance for Leveraged Outlier Detection	0.0 to 1.0	3.2
706	8	DOUBLE	lofTol	tolerance for LOF (aka "LOF parameter")	0.0 to 1.0	3.2
714	8	DOUBLE	distTol	tolerance for Euclidean or Mahalanobis Distance	0.0 to 1.0	3.2
722	8	DOUBLE	predSlopeCorrect	prediction linear correction for Slope	Usage specific	3.2
730	8	DOUBLE	predBiasCorrect	prediction linear correction for Bias	Usage specific	3.2
738	8	DOUBLE	predLimitLoEndpoint	prediction valid range, low point	-999 to 999	3.2
746	8	DOUBLE	predLimitHiEndpoint	prediction valid range, high point	0 to 999	3.2
754	8	DOUBLE	alertLimitLoEndpoint	clinical valid range, low point	-999 to 999	3.2
762	8	DOUBLE	alertLimitHiEndpoint	clinical valid range, high point	0 to 999	3.2
770	608	CONTROL_ELEM	ctrlRefMatrix	control reference values	N/A	3.3.5

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
1378	530	RANK_ELEM	skinPredMatrix[1]	skin prediction coefficient # 1	N/A	3.3.13
1908	530	RANK_ELEM	skinPredMatrix[2]	skin prediction coefficient # 2	N/A	3.3.13
2438	530	RANK_ELEM	skinPredMatrix[3]	skin prediction coefficient # 3	N/A	3.3.13
2968	530	RANK_ELEM	loadMatrix[1]	outlier coefficient # 1 (contains the PLS loadings used for LOF)	N/A	3.3.13
3498	530	RANK_ELEM	loadMatrix[2]	outlier coefficient # 2	N/A	3.3.13
...	...	...	...	...	...	...
26288	530	RANK_ELEM	loadMatrix[45]	outlier coefficient # 45	N/A	3.3.13
26818	8	DOUBLE	svdLoadVector[1]	SVD loading coefficient #1	Usage specific	3.2
26826	8	DOUBLE	svdLoadVector[2]	SVD loading coefficient #2	Usage specific	3.2
...	...	...	...	...	...	...
27322	8	DOUBLE	svdLoadVector[64]	SVD loading coefficient #64	Usage specific	3.2

3.3.4 CONFIG_DATA Format

Table 5 describes the format of the CONFIG_DATA data structure.
Offset is measured from the beginning of the structure.
Total structure size is 88 bytes.

Table 5: CONFIG_DATA Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	8	DOUBLE	sensorTol[1]	sensor channel 1 tolerance	Usage Specific	3.2
8	8	DOUBLE	sensorTol[2]	sensor channel 2 tolerance	Usage Specific	3.2
16	8	DOUBLE	sensorTol[3]	sensor channel 3 tolerance	Usage Specific	3.2
72	8	DOUBLE	sensorTol[4 to 10]	...	...	...
80	8	DOUBLE	sensorTol[11]	sensor channel 11 tolerance	Usage Specific	3.2

3.3.5 CONTROL_ELEM Format

Table 6 describes the format of the CONTROL_ELEM data structure.
Offset is measured from the beginning of the structure.
Total structure size is 608 bytes.

Table 6: CONTROL_ELEM Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	8	RTC_TIME	date	date manufacturing or field collected "Control" pixel measurements were made.	Usage Specific	3.2
8	8	DOUBLE	ctrlRefLimit	allowable deviation that the "Control" pixel measurements may drift from the manufacturing or field collected measured values.	Usage Specific	3.2
16	80	DOUBLE	ctrlRefSensors[10]	sensor readings at time the manufacturing or field collected "Control" measurements were made.	Usage Specific	3.2
96	512	DOUBLE	ctrlRefVector[64]	manufacturing or field collected "Control" pixel measurements.	Usage Specific	3.2

3.3.6 OPER_PARMS Format

Table 7 describes the format of the OPER_PARMS data structure.
Times are in timer ticks (10 milliseconds).
Offset is measured from the beginning of the structure.
Total structure size is 84 bytes.

Table 7: OPER_PARMS Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	4	UDWORD	ramEndedDelay	Delay from end of ram movement to start of A/D reading. Default is 100 (One Second.)	0 to 6000	3.2
4	4	UDWORD	shutterClosedDelay	Shutter closing time before dark reading. Default is 500 (five seconds.)	0 to 6000	3.2
8	2	INT16	dark_IntegrationPoints	Dark integration points. Default is 3640.	1 to 32767	3.2
10	2	INT16	ref_IntegrationPoints	Reference integration points. Default is 3640.	1 to 32767	3.2
12	2	INT16	ctrl_IntegrationPoints	Control integration points. Default is 3640.	1 to 32767	3.2
14	2	INT16	skin_IntegrationPoints	Skin integration points. Default is 910.	1 to 32767	3.2
16	4	UDWORD	ditherEndedDelay	Delay from end of dither movement to start of A/D reading. Default is 8 (80 milliseconds.)	0 to 6000	3.2
20	2	INT16	readsPerDither	Number of skin readings per dither sequence. Default is 16.	0 to 32767	3.2
22	2	INT16	firstRefReadings	Number of first reference readings. Default is one.	0 to 32767	3.2
24	2	INT16	ctrlReadings	Number of control readings. Default is one.	0 to 32767	3.2
26	2	INT16	secondRefReadings	Number of second reference readings. Default is one.	0 to 32767	3.2
28	2	INT16	darkReadings	Number of dark readings. Default is one.	0 to 32767	3.2
30	2	INT16	darkCorrectEnable	Dark correction enable. Default is enabled.	0 or 1	3.2
32	2	INT16	ditherSteps	Dither steps. Default is 120.	0 to 2000	3.2
34	2	INT16	ditherStepsHalfSpeed	Half speed dither steps. Default is 12.	0 to 2000	3.2
36	8	DOUBLE	refRatioLoLimit	Reference ratio check limits. Default is 0.997	0.1000 to 10.0000	3.2
44	8	DOUBLE	refRatioHiLimit	Reference ratio check limits. Default is 1.003	0.1000 to 10.0000	3.2
52	2	INT16	skinLevelPixel	Which pixel used for skin level check. Default is pixel 7.	1 to 64	3.2
54	8	DOUBLE	skinLevelPixelLoLimit	Pixel skin level check low limit. Default is 0.3	0.1000 to 10.0000	3.2
62	8	DOUBLE	skinLevelPixelHiLimit	Pixel skin level check high limit. Default is 0.95	0.1000 to 10.0000	3.2
70	2	INT16	warmUpDelayEnabled	Machine warm-up delay enable. Default is not enabled?	0 = no delay 1 = delay time 2 = sensor range	3.2
72	4	UDWORD	warmUpDelayTime	If warmUpDelayEnabled is 1 this defaults to 1080000. Disables the machine for three hours after turn on.	0 to 4,294,967,295	3.2
76	8	INT16[4]	expansionFill1 - 4		0xFFFF	3.2

3.3.7 MDM_READING Format

The following table describes the format of the MDM_READING data structure.
Total structure size is 46 bytes

Table 8: MDM_READING Structure in Modem Flash Memory

Offset (Bytes)	Structure Size (Bytes)	Structure	Field Name	Description	Format Reference
0	4	OBJECT_HEADER	objHdr	Standard object header	3.3.9
4	18	READING_ID	readingID	Machine, patient, & mode information	3.3.10
22	24	READING	reading	Evaluation or Measurement mode Reading.	3.3.11

3.3.8 ObjectID Object type identifiers

The following table lists the basic ObjectID types used in Diasensor 2000 internal and telemedicine data structures.

Value	Name	Function
0	UNKNOWN	Object type is undefined
1	COMMAND	This is a command
2	DATA_PACKET	This is a data packet
3	EVENT	This is an internal processing event record
4	SPECTRUM	This is a spectrum
5	READING	This is an evaluation or measurement reading
6	SPECTRUM_STATUS	This is a spectrum status
7	EOD_DATE	This is a sitting Date for data in modem flash memory
8	POWER_ON_TIME	This is a Power on time record
9	UNIT_SERIAL_NUMBER	This is a Unit serial number record
10	ALERT	This is a sitting status change alert
16	MACHINE_DATA_UPDT	This is an update to machine data from telemedicine
17	PATIENT_DATA_UPDT	This is an update to patient data from telemedicine
126	END_OF_FILE	This is an end of file record (01111110 binary)
127		Reserved (01111111 binary)

3.3.9 OBJECT_HEADER Structure Format

The following table describes the format of the OBJECT_HEADER data structure that is placed as the first field in any object that can be queued.

Offset is measured from the beginning of the structure.

Total structure size is 4 bytes.

Table 9: OBJECT_HEADER Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	2	ObjectID	id	This object's identifier	0-255	3.2
2	2	UWORD	size	This object's size in bytes	0 to 65,535	3.2

3.3.10 READING_ID Format

The following table describes the format of the READING_ID data structure.

Total structure size is 18 bytes

Table 10: READING_ID Structure in Modem Flash Memory

Offset (Bytes)	Structure Size (Bytes)	Structure	Field Name	Description	Range	Format Reference
0	4	UDWORD	bico_user_id	User ID character string that contains the creation site and a unique, 6 character patient ID number for that site.	4 digit creation site and a unique 6 digit patient number	3.2
4	12	UCHAR[32]	serial_num	Machine serial number character string	null-terminated string, up to 11 characters	3.2
16	2	UWORD	mode	Instrument operating mode	1 = calibration 2 = evaluation 3 = measurement 4 = recalibration	3.2

3.3.11 READING Format

Table 11 describes the format of the READING data structure.
Offset is measured from the beginning of the structure.
Total structure size is 24 bytes.

Table 11: READING Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	2	UWORD	empty	nonzero if structure is empty, zero otherwise	0 or 0xFFFF	3.2
2	8	RTC_TIME	time	date & time that information was stored	Usage specific	3.3.14
10	2	INT	glucose	measured blood glucose (mg/dL)	-32,768 to 32,767	3.2
12	2	INT	control	control sample (absorbance * 100,000)	-32,768 to 32,767	3.2
14	2	INT	invasive	invasive meter measurement (mg/dL)	-32,768 to 32,767	3.2
16	2	INT	bin	measurement "bin" code (e.g. before or after eating)	Usage specific	3.2
18	2	INT	qm_flag	quality monitoring indicator; if nonzero, then this reading was used for QM purposes	0 or 1	3.2
20	2	UWORD	status	measurement algorithm completion status code	Usage specific	3.2
22	2	INT	correction	bias correction value used to get this measurement. in units of mg/dL	-32,768 to 32,767	3.2

3.3.12 RANGE_ELEM Format

Table 12 describes the format of the RANGE_ELEM data structure.
Offset is measured from the beginning of the structure.
Total structure size is 16 bytes.

Table 12: RANGE_ELEM Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	8	DOUBLE	loEndPoint	minimum range value	Usage specific	3.2
8	8	DOUBLE	hiEndPoint	maximum range value	Usage specific	3.2

3.3.13 RANK_ELEM Format

Table 13 describes the format of the RANK_ELEM data structure.
Offset is measured from the beginning of the structure.
Total structure size is 530 bytes.

Table 13: RANK_ELEM Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	2	UWORD	rankNum	rank identifier	1 to 64	3.2
2	8	DOUBLE	rankWeight	rank statistical weight	Usage specific	3.2
10	8	DOUBLE	calbConst	rank calibration constant (also known as lack-of-fit critical value)	Usage specific	3.2
18	8	DOUBLE	calbVector[1]	calibration vector for spectra channel 1	Usage specific	3.2
26	8	DOUBLE	calbVector[2]	calibration vector for spectra channel 2	Usage specific	3.2
34	8	DOUBLE	calbVector[3]	calibration vector for spectra channel 3	Usage specific	3.2
...	...	...	...	...	...	...
522	8	DOUBLE	calbVector[64]	calibration vector for spectra channel 64	Usage specific	3.2

3.3.14 RTC_TIME Format

Table 14 describes the format of the RTC_TIME data structure.
Offset is measured from the beginning of the structure.
Total structure size is 8 bytes.

Table 14; RTC_TIME Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	1	UCHAR	seconds	seconds	0 to 59	3.2
1	1	UCHAR	minutes	minutes	0 to 59	3.2
2	1	UCHAR	hours	hours	0 to 23	3.2
3	1	UCHAR	day_of_week	Sunday to Saturday	1 to 7	3.2
4	1	UCHAR	day_of_month	calendar day	1 to 31	3.2
5	1	UCHAR	month	month of year	1 to 12	3.2
6	2	UWORD	year	year	0 to 65,535	3.2

3.3.15 UNIT_INFO Format

Table 15 describes the format of the UNIT_INFO data structure.
Offset is measured from the beginning of the structure.
Total structure size is 216 bytes.

Table 15: UNIT_INFO Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	8	RTC_TIME	build_time	manufacturing build date and time	N/A	3.3.14
8	12	UCHAR[12]	serial_num	serial number character string	null-terminated string, up to 11 characters	3.2
20	2	UWORD	mode	instrument operating mode	1 = calibration 2 = evaluation 3 = measurement 4 = recalibration	3.2
22	8	DOUBLE	sensor_coeff[1]	scaling coefficient for sensor 1	Usage Specific	3.2
30	8	DOUBLE	sensor_coeff[2]	scaling coefficient for sensor 2	Usage Specific	3.2
...	...	...	...	...	...	...
102	8	DOUBLE	sensor_coeff[11]	scaling coefficient for sensor 11	Usage Specific	3.2
110	2	UWORD	sensor_algor[1]	sensor scaling algorithm for sensor 1	Usage Specific	3.2
112	2	UWORD	sensor_algor[2]	sensor scaling algorithm for sensor 2	Usage Specific	3.2
...	...	...	...	...	...	...
130	2	UWORD	sensor_algor[11]	sensor scaling algorithm for sensor 11	Usage Specific	3.2
132	84	OPER_PARMS	operParams	machine operating parameters	Usage Specific	3.2

3.3.16 USER_INFO Format

Table 16 describes the format of the USER_INFO data structure.
Offset is measured from the beginning of the structure.
Total structure size is 30 bytes.

Table 16: USER_INFO Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	4	UDWORD	bico_user_id	user ID contains the creation site and a unique, 6 digit patient ID number for that site.	0 – 4 294967296	3.2
4	18	UCHAR[18]	user_name	user name character string	null-terminated string, up to 17 characters	3.2
22	8	RTC_TIME	calib_time	date and time of user calibration	N/A	3.3.14

3.3.17 BIAS_CORRECT Format

Table 17 describes the format of the BIAS_CORRECT data structure.
Offset is measured from the beginning of the structure.
Total structure size is 26 bytes.

Table 17: BIAS_CORRECT Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	2	INT	count	count of valid deltas in array	0 to 5	3.2
2	2	INT	oldest	index of oldest delta value in array (next one to be replaced)	0 to 4	3.2
4	2	INT	correction	bias correction value in units of mg/dL	-32,768 to 32,767	3.2
6	10	INT[5]	delta[5]	array of correction deltas (difference between Diasensor reading and invasive meter reading)	-32,768 to 32,767	3.2
16	8	RTC_TIME	last_update	date and time of most recent successful QM check or date and time of most recent QM initialization reading.	N/A	3.3.14
24	2	UWORD	crc_16	Cyclic Redundancy Check	0 to 65535	3.2

3.3.18 HEMO_AVG format

Table 18 describes the format of the HEMO_AVG data structure. This is used to save the running average for each bin code.
Offset is measured from the beginning of the structure.
Total structure size is 290 bytes.

Table 18: HEMO_AVG Structure Format

Offset (Bytes)	Structure Size (Bytes)	Structure	Field Name	Description	Format Reference
0	18	INT	oldest [9]	index of oldest reading	3.2
18	270	INT	hemo_avg[9][15]	array of readings per bin code	3.2
288	2	UWORD	crc_16	Cycle Redundancy check	3.2

3.3.19 CONTROL_COUNTERS Format

Table 19 describes the format of the CONTROL_COUNTERS data structure.
Offset is measured from the beginning of the structure.
Total structure size is 36 bytes.

Table 19: CONTROL_COUNTERS Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	2	UWORD	data_type	Type of data to store:	0 = no data 1 = Spectra 2 = Avg Absorb 3 = Reading 4 = Spect & Read 5 = Absrb & Read	3.2
2	2	UWORD	dest_spect	Destination for spectral or absorbance data. Ignored if data_type does not include Spectra or Absorbance.	0 = User Card 1 = Modem Card 2 = Serial Port 3 = User & Modem cards	3.2
4	2	UWORD	dest_read	Destination for readings data. Ignored if data_type does not include Reading.	0 = User Card 1 = Modem Card 2 = Serial Port 3 = User & Modem cards	3.2
6	2	INT	gd_days_rqd	Number of good days data required for calibration, recalibration, or evaluation.	0 to 99	3.2
8	2	INT	gd_sitng_rqd	Number of good sittings required for calibration, recalibration, or evaluation.	0 to 255	3.2
10	2	INT	gd_days	Number of good days of data	0 to 32,767	3.2
12	2	INT	gd_sittings	Number of good sittings	0 to 32,767	3.2
14	8	RTC_TIME	lastGoodDay	Date for day of last good sitting	N/A	3.3.14
22	8	RTC_TIME	lastGoodSit	Date for day of last good countable sitting	N/A	3.3.14
30	2	UWORD	new_user_info	This field is checked when a patient starts a data collection sequence and a patient's User Card is in the Diasensor. If not zero, designated update is performed; then field is set to 0.	See 3.3.19.1 below for details	3.2
32	2	UWORD	misc_enables	This field has the patient hold flag, hemo average enable, prediction average enable, and demo enable flags	See 3.3.19.2 below for details	3.2
34	2	UWORD	crc_16	Cyclic Redundancy Check	0 to 65535	3.2

3.3.19.1 Format of the "new_user_info" Bit Field

Table 20 defines the new_user_info bit field.

Wait for a Patient User Card insertion, wait for patient to press Start, and validate the User Card user id and unit serial number against the machine's 186 flash memory before issuing the operations specified by this field.

Offset is measured from the least significant or right bit of the field.

Total field size is 2 bytes.

Table 20: Format of the "new_user_info" Bit Field

Bit	Mask	Weight	Description – Perform task if Bit has a 1
0	0x0001	1	New Patient data received via User Card. Destination is Diasensor 186 Flash memory.
1	0x0002	2	New Patient data received via Telemedicine from BICO. Update Diasensor 186 Flash memory. Destination is User Card.
2	0x0004	4	Update Patient's USER_ID
3	0x0008	8	Update Patient's SKIN_LIBRARY
4	0x0010	16	Update CONFIG_DATA
5	0x0020	32	Update TELEMED data
6	0x0040	64	Update BIAS_CORRECT
7	0x0080	128	Update data_type, dest_spect, dest_read, gd_days_reqd, gd_sitng_rqd
8	0x0100	256	Update gd_days, gd_sittings
9	0x0200	512	Update misc_enables flags: USER_ON_HOLD, DISP_HEMO_AVG & DISP_PRED_AVG
10	0x0400	1024	Update HEMO_AVG data
11	0x0800	2048	Update OPER_PARMS
12	0x1000	4096	
13	0x2000	8192	
14	0x4000	16384	
15	0x8000	32768	Remove Patient from Diasensor.

When updates are completed:

Change destination's new_user_info to 0 and rewrite destination flash

Change source's new_user_info to 0 and rewrite source flash

3.3.19.2 Format of the "misc_enables" Bit Field

Wait for a Patient User Card insertion, wait for patient to press Start, and validate the User Card user id and unit serial number against the machine's 186 flash memory before issuing the operations specified by this field.

Offset is measured from the least significant or right bit of the field.

Table 21 defines the misc_enables bit field.

Table 21: Format of the "misc_enables" Bit Field

Bit	Mask	Weight	Description -- Perform task if Bit has a 1
0	0x0001	1	USER_ON_HOLD = Put Patient on hold
1	0x0002	2	DISP_HEMO_AVG = Display hemocue average screen
2	0x0004	4	DISP_PRED_AVG = Display prediction averages for measure mode
3	0x0008	8	DEMO_ENABLE = Demo Mode if set to 1
4	0x0010	16	unused
5	0x0020	32	unused
6	0x0040	64	unused
7	0x0080	128	unused
8	0x0100	256	unused
9	0x0200	512	unused
10	0x0400	1024	unused
11	0x0800	2048	unused
12	0x1000	4096	unused
13	0x2000	8192	unused
14	0x4000	16384	unused
15	0x8000	32768	unused

Telemedicine Structures

The following sections describe the Telemedicine structures on the User Card used to communicate with BICO via the Internet.

3.3.20 TELEMED Format

Table 22 describes the format of the TELEMED data structure.
Offset is measured from the beginning of the structure.
Total structure size is 570 bytes.

Table 22: TELEMED Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Format Reference
0	80	PHONE_DATA	phone_data	Internet access telephone Information and modem protocols	3.3.21
80	264	MODEM_DATA	modem_data	Modem initialization data	3.3.22
344	224	ACCESS_INFO	internet_defn	Internet logon and internet protocol data	3.3.23
568	2	UWORD	crc_16	Cyclic Redundancy Check	3.2

3.3.21 PHONE_DATA Format

Table 23 describes the format of the PHONE_DATA data structure.
Offset is measured from the beginning of the structure.
Total structure size is 80 bytes.

Table 23: PHONE_DATA Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	36	UCHAR[36]	phoneNumber	Internet Access Phone Number	7 to 19 characters	3.2
36	36	UCHAR[36]	alt_phoneNumber	Alternate Internet Access Phone Number	7 to 19 characters	3.2
72	2	UWORD	maxRetries	Maximum number of times to retry before quitting for night.	1 to 127	3.2
74	2	UWORD	maxRetryDays	Maximum number of days to retry data transfer before putting patient on hold.	1 to 999	3.2
76	2	UWORD	dialingStarts	Start dialing BICO at this time-of-day	0 to 23	3.2
78	2	UWORD	dialingEnds	Quit dialing at this time-of-day if not done.	0 to 23	3.2

3.3.22 MODEM_DATA Format

Table 24 describes the format of the MODEM_DATA data structure.
Offset is measured from the beginning of the structure.
Total structure size is 264 bytes.

Table 24: MODEM_DATA Structure

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	2	UWORD	data_bits	Number of data bits per character in modem protocol.	7 or 8	3.2
2	2	UWORD	parity	Modem Protocol Parity.	0 = none 1 = odd 2 = even 3 = mark 4 = space	3.2
4	2	UWORD	stop_bits	Number of stop bits in modem protocol.	1 or 2	3.2
6	1	BOOL	use_flow_ctl.	Use Flow Control.	0 = none 1 = flowcntrl	3.2
7	1	BOOL	flow_ctl.	Kind of Flow Control.	0 = hrdware 1 = software	3.2
8	256	UCHAR[256]	mdm_init.	Modem Initialization String.	Up to 255 characters	3.2

3.3.23 ACCESS_INFO Format

Table 25 describes the format of the telemedicine ACCESS_INFO data structure.
Offset is measured from the beginning of the structure.
Total structure size is 224 bytes.

Table 25: ACCESS_INFO Structure Format

Offset (Bytes)	Field Size (Bytes)	Format	Field Name	Description	Range	Format Reference
0	12	UCHAR[12]	isp_logonid	Internet access logon identity	7 to 11 characters	3.2
12	12	UCHAR[12]	isp_password	Internet access password	7 to 11 characters	3.2
24	1	BOOL	server_assign	ISP Server automatically assigned IP Address.	0 = no 1 = yes	3.2
25	1	UCHAR	isp_AP_enable	ISP Authentication Protocol enable	0 = none 1 = PAP 2 = CHAP	3.2
26	16	UCHAR[16]	Isp_Ip_addr	Used only if the ISP Server doesn't automatically assign an IP Address	1 to 15 chars	3.2
42	1	BOOL	Ip_hdr_compr	Use IP Header Compression	0 = no 1 = yes	3.2
43	1	BOOL	default_gateway	Use default gateway on remote control	0 = no 1 = yes	3.2
44	16	UCHAR[16]	gateway_ipAddr	IP address of the BICO FTP server	1 to 15	3.2
60	12	UCHAR[12]	bico_logonid	BICO access logon identity initially will be an 8 character derivative of the Unit Serial Number	7 to 11 characters	3.2
72	12	UCHAR[12]	bico_password	BICO access password	7 to 11 characters	3.2
84	46	UCHAR[46]	upload_to	Directory to place patient readings	8 to 45 chars	3.2
130	46	UCHAR[46]	download_from	Directory where to check for and download patient User Card and/or TELEMED updates	8 to 45 chars	3.2
176	16	UCHAR[16]	bicoProxyServer	IP address of the BICO Proxy server	1 to 15 chars	3.2
192	16	UCHAR[16]	bicoFtpServer	spare IP address	1 to 15 chars	3.2
208	16	UCHAR[16]	spare_Ip_addr	spare IP address	1 to 15 chars	3.2

4 Revision Record

Rev.	Status	Description	Author	Effectove Date
0	Preliminary	Initial document describing Data formats used for D2000 software development		08-25-99
1	Preliminary law	Initial document describing Data formats used for D2000 software development		02-10-00
2		Revision to change structure used to record readings on the user card and reading capacity of the card.		02-23-00
3	Final law	Revision to change: "measured control sample glucose (mg/dL)" to "control sample (absorbance * 100,000)"		04-10-00
AA		Initial release to Production		04-24-00