AMI 1.1 OTA Interface Definition

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Revision History

Revision 1.1.0	8-6-2013	NPF

Abstract

AMI OTA IDL documentation.

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1. Introduction

This is auto-generated documentation generated from various Protobuf [1] source definitions.

The messages make extensive use of the Protobuf field rule *optional*. This is for future compatibility reasons. Unless specified in the field description all fields are expected to be present.

2. File: ami_defs.proto

2.1. Enum: Prev

Protocol revision.

Element	Value	Description
PREV_AMI_1_1	0	AMI 1.1
PREV_AMI_1_2	1	AMI 1.2

2.2. Enum: Constants

Miscellaneous constants.

Element	Value	Description
MAX_DL_MSG_SIZE_AMI_1_1	0	Maximum non-resumable downlink message size for AMI 1.1.
MAX_DL_NR_MSG_SIZE_AMI_1_2	1	Maximum non-resumable downlink message size for AMI 1.2. 458 * 2
MAX_UL_MSG_SIZE_AMI_1_1	2	Maximum non-resumable uplink message size for AMI 1.1.
MAX_UL_NR_MSG_SIZE_AMI_1_2	3	Maximum non-resumable uplink message size for AMI 1.2. 458 * 7
MSG_HEADER_SIZE	4	Message header size.
RESET_MAGIC	5	0x975d magic number for reset requests.

2.3. Enum: MsgId

Message ID enumeration. Certain tools rely on the relationship between the name in this enum and the top level message names following the form BOOT_IND -> BootInd.

Element	Value	Description
MSG_ID_NIL	0	
BOOT_IND	1	BootInd
METER_CONFIG_REPORT_REQ	2	MeterConfigReportReq
METER_CONFIG_REPORT_RSP	3	MeterConfigReportRsp
SET_DATA_ORDERS_REQ	4	SetDataOrdersReq

Element	Value	Description
RELAY_OPERATION_REQ	5	RelayOperationReq
RELAY_OPERATION_RSP	6	RelayOperationRsp
BILLING_DATA_REQ	7	BillingDataReq
BILLING_DATA_RSP	8	BillingDataRsp
BILLING_DATA_IND	9	BillingDataInd
LOAD_PROFILE_IND	10	LoadProfileInd
POWER_QUALITY_EVENT_IND	11	PowerQualityEventInd
POWER_QUALITY_REPORT_REQ	12	PowerQualityReportReq
POWER_QUALITY_REPORT_RSP	13	PowerQualityReportRsp
APP_EVENT_IND	14	AppEventInd
METER_FLAG_IND	15	MeterFlagInd
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ERROR_IND	18	ErrorInd
RESET_DEVICE_REQ	19	ResetDeviceReq
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PANIC_BLOCK_REQ	22	PanicBlockReq
PANIC_BLOCK_RSP	23	PanicBlockRsp
DEMAND_RESET_REQ	24	DemandResetReq
DEMAND_RESET_RSP	25	DemandResetRsp
METER_FLAG_REQ	26	MeterFlagReq
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RELAY_STATE_REQ	29	RelayStateReq
RELAY_STATE_RSP	30	RelayStateRsp
READ_METER_TABLE_REQ	31	ReadMeterTableReq
READ_METER_TABLE_RSP	32	ReadMeterTableRsp
WRITE_METER_TABLE_REQ	33	WriteMeterTableReq
WRITE_METER_TABLE_RSP	34	WriteMeterTableRsp
START_METER_PROCEDURE_REC	35	StartMeterProcedureReq
START_METER_PROCEDURE_RSF	36	StartMeterProcedureRsp
SET_CONFIG_REQ	37	SetConfigReq
SET_CONFIG_RSP	38	SetConfigRsp
SEASON_CHANGE_REQ	39	SeasonChangeReq
SEASON_CHANGE_RSP	40	SeasonChangeRsp
END_DEVICE_INFO_REQ	41	EndDeviceInfoReq
END_DEVICE_INFO_RSP	42	EndDeviceInfoRsp

Element	Value	Description
CLEAR_PANIC_BLOCKS_REQ	43	ClearPanicBlocksReq
GET_CONFIG_VALUE_REQ	44	GetConfigValueReq
GET_CONFIG_VALUE_RSP	45	GetConfigValueRsp
HANDLE_ERROR_REQ	46	HandleErrorReq
GET_MCM_UPTIME_REQ	47	GetMcmUptimeReq
GET_MCM_UPTIME_RSP	48	GetMcmUptimeRsp
METER_IND	49	MeterInd
C12_19_REQ_AMI_1_1	50	C1219ReqAmi11 DEPRECATED
C12_19_RSP_AMI_1_1	51	C1219RspAmi11 DEPRECATED
C12_19_ABORT_REQ_AMI_1_1	52	C1219AbortReqAmi11 DEPRECATED
LOAD_PROFILE_REQ	53	LoadProfileReq
LOAD_PROFILE_RSP	54	LoadProfileRsp
RTP_CHANGE_REQ	55	RtpChangeReq
RTP_CHANGE_RSP	56	RtpChangeRsp
C12_19_REQ	57	C1219Req
C12_19_RSP	58	C1219Rsp
C12_19_ABORT_REQ	59	C1219AbortReq

2.4. Enum: ResultCode

Result codes used in OTA messages.

Element	Value	Description
SUCCESS	0	Success.
FAILURE	1	Generic failure.
METER_PWRFAIL	2	Meter related. Meter transaction failed due to meter power failure
METER_TIMEOUT	3	Meter never responded.
METER_UNSUPPORTED	4	Unsupported meter request.
METER_INVALID	5	Invalid meter request.
METER_QUEUE_FULL	6	The meter command queue was full and comm with meter was not attempted
METER_INITIAL_TABLE_ERR	7	Error in reading the initial tables
METER_COMM_INDEX	8	Bits 7,8 indicate the index
AHP_UNKNOWN_MSG_ID	9	AHP related.
AHP_MALFORMED_REQ	10	
AHP_FEATURE_NOT_SUPPORTED	11	
AHP_BUSY	12	
AHP_UNSUPPORTED	13	

Element	Value	Description
AHP_INVALID	14	
AHP_BAD_KEY	15	
AHP_LOCKED	16	
APP_UNSUPPORTED	17	APP related.
APP_QUEUE_FULL	18	
APP_BAD_MAGIC_NUMBER	19	
APP_UNKNOWN_MSG	20	
APP_INVALID_PARAMETER	21	
APP_INVALID_DEVICE_TYPE	22	
APP_TTL_EXPIRED	23	
APP_SCHEDULE_BOUND_EXCEEI	24	
APP_METER_CONFIG_HASH_UNA	25	
APP_METER_CONFIG_HASH_MIS	26	
APP_ORDER_ID_UNEXPECTEDLY	27	
APP_ACTION_SUCCESSFULLY_S(	28	
APP_ACTION_SUCCESSFULLY_C/	29	
APP_INCOMPLETE	30	
CFG_BAD_NVM_ACCESS	31	CFG related.
CFG_UNINITIALIZED	32	
CFG_BAD_VERSION	33	
CFG_BAD_CRC	34	
CFG_IN_PROGRESS	35	
CFG_INVALID_FILE_ID	36	
CFG_INVALID_LENGTH	37	
CFG_UNAUTHORIZED	38	
CFG_INVALID_PARAMETER	39	
CFG_UNEXPECTED_LENGTH	40	
OTA_UNKNOWN_ASSOCIATION	41	Error codes caused by handling OTA messages
OTA_UNSUPPORTED_PREV	42	
OTA_DL_MSG_DROPPED	43	
PROGRAM_SEQUENCE_OPERATI(	44	Error codes associated with C12.19 Program Sequence exceptions
PROGRAM_SEQUENCE_INVALID_	45	
PROGRAM_SEQUENCE_TIME_EX	46	
PROGRAM_SEQUENCE_COMPATI	47	
PROGRAM_SEQUENCE_AUDIT_F/	48	
PROGRAM_SEQUENCE_VALIDAT	49	

Element	Value	Description
METER_PROC_PROCEDURE_NUM	50	Error codes from procedure verification failures
METER_PROC_SEQUENCE_NUME	51	
METER_PROC_SEQUENCE_NUME	52	
METER_PROC_RESULT_CODE_PA	53	
METER_PROC_PROCEDURE_NUM	54	
METER_PROC_PROCEDURE_TYPI	55	
METER_PROC_PROCEDURE_TYPI	56	
METER_PROC_ACCEPTED_NOT_C	57	Error codes from procedures which did not complete
METER_PROC_INVALID_PARAME	58	
METER_PROC_CONFLICT_WITH_	59	
METER_PROC_TIMING_PROBLEM	60	
METER_PROC_NO_AUTHORIZATI	61	
METER_PROC_START_FAILURE	62	Error codes from comm failures during procedure execution
METER_PROC_VERIFICATION_FA	63	
C1219REQ_NVM_ACCESS_FAILUI	64	Additional error codes associated with C12.19 Program Sequence exceptions * that are related with corrupted memory
C1219RSP_NVM_ACCESS_FAILUR	65	
C1219RSP_BUFFER_ALLOCATION	66	
DL_RESUMABLE_STREAM_MSG_	67	C12.19 Program Sequence exceptions associated with USP stream issues
DL_RESUMABLE_STREAM_INVA	68	
UL_RESUMABLE_STREAM_STAR	69	
PROGRAM_SEQUENCE_NUM_EX	70	C12.19 Program Sequence exception retry exceeded error
PROGRAM_SEQUENCE_COMPLET	71	C12.19 Program Sequence completed with operation level failure(s)
METER_COMM_INDEX_0x48	72	values 0x08; 0x48; 0x88; 0xC8 reserved for METER_COMM_INDEX
METER_COMM_INDEX_0x88	73	
METER_COMM_INDEX_0xC8	74	

2.5. Enum: BoardType

EMCM board types.

Element	Value	Description
BOARD_TYPE_KITE	0	Kite EMCM (for Vision meters).

Element	Value	Description
BOARD_TYPE_RAPTOR	1	Raptor EMCM (for various meters)
BOARD_TYPE_FALCON	2	Falcon EMCM (for GE SGM3XXX meters)
BOARD_TYPE_REX	3	Rex EMCM (deprecated)
BOARD_TYPE_PTERO	4	Ptero EMCM (for GE kV2c meters)

2.6. Enum: MeterType

Meter types.

Element	Value	Description
METER_TYPE_NIL	0	
GE_I210_PLUS	1	GE i210+, i210+n
GE_I210_PLUS_C	2	GE i210+C, i210+Cn
GE_SGM3000	3	GE SGM3XXX
VISION_V2S	4	Vision V2S/XT
GE_KV2C	5	GE kV2c
LG_FOCUS_AX	6	L+G Focus AX, AXR, etc
LG_S4X	7	L+G S4x
EDMI_MK7B	8	EDMI Mk7B
ELSTER_A3	9	Elster A3x

2.7. Enum: MeterTableType

ANSI C12.19 table enumeration.

Element	Value	Description
STD_TBL	0	Standard table.
MFG_TBL	1	Manufacturer table.

2.8. Enum: MeterProcedureType

ANSI C12.19 procedure enumeration.

Element	Value	Description
STD_PROC	0	Standard procedure.
MFG_PROC	1	Manufacturer procedure.

2.9. Enum: EmcmBuildType

Build type.

Element	Value	Description
EMCM_BUILD_TYPE_COMMSYS_	0	Deprecated.
EMCM_BUILD_TYPE_COMMSYS_	1	Deprecated.
EMCM_BUILD_TYPE_COMMSYS_	2	CommSys 2.x debug build.
EMCM_BUILD_TYPE_COMMSYS_	3	CommSys 2.x release build.
EMCM_BUILD_TYPE_UNKNOWN	4	

2.10. Enum: BootType

Boot type

Element	Value	Description
BOOT_TYPE_UNKNOWN	0	Unknown
BOOT_TYPE_EXCEPTION	1	Exception
BOOT_TYPE_PANIC	2	Panic
BOOT_TYPE_APP	3	App
BOOT_TYPE_WDOG	4	Watchdog
BOOT_TYPE_POR	5	POR
BOOT_TYPE_LVD	6	LVD

2.11. Enum: AppEvent

Element	Value	Description
RESERVED_0	0	
RESERVED_1	1	
METER_TIME_INCORRECT	2	Indicates that the meter's time is incorrect (on set) or now correct (on clear).
METER_COMM_ERROR	3	Indicates that a communication error with the meter occurred.
INTERNAL_RESET_APP_INACTIV	4	Indicates that the device activated a failsafe due to an application stall.
INTERNAL_RESET_NO_TX_BUF	5	Indicates that the device activated a failsafe due to inability to enqueue TX messages.
INTERNAL_RESET_POWERED_BE	6	Indicates that power had been restored before last gasp transmission completed.
INTERNAL_RESET_POWERED_AF	7	Indicates that power had been restored after last gasp transmission completed.
OTA_RESET	8	Indicates that an OTA reset was accepted and data orders were preserved.

Element	Value	Description
OTA_RESET_ERASE_FLASH	9	Indicates that an OTA reset was accepted and data orders were marked for erasure.
AHP_RESET	10	Indicates that an AHP serial reset was accepted.
CDLD_CUTOVER_ATTEMPT	11	Indicated that a CDLD cutover attempt took place
INTERNAL_RESET_NODE_RESET	12	Indicates that a node reset was detected before last gasp transmission completed.
APP_NODE_PF_STATE_MISMATC	13	Indicates a discrepancy between the node's and app's notion of node's PF state.
NODE_NOT_IN_PF_DURING_LAST	14	Indicates the node unexpectedly left the power failed state during last gasp.
NODE_UNJOINED_DURING_LAST	15	Indicates the node is not joined, yet we missed the notice of last gasp failure.

2.12. Enum: BootResult

Boot results

Element	Value	Description
BOOT_SUCCESS	0	Boot resulted in a success
BOOT_BAD_CONFIG	1	Boot resulted in a bad config
BOOT_POST_FAIL	2	Boot resulted in a post fail
BOOT_AUTH_LOST	3	Boot resulted in an auth failure

3. File: ami_msg.proto

3.1. Message: AmiOtaInfOptions

Field	Type	Rule	Description
display_hint	DisplayHintEnum	optional	

3.2. Message: BootInd

Boot Indication

Field	Type	Rule	Description
bootDetails	BootDetails	optional	Included if bootReason is abnormal.
meterDataReportHash	bytes	optional	Hash over meter tables relevant to data reporting.

Field	Type	Rule	Description
			Included if hash is computable. Included if not authorized (ie needHashesAuthorized==true).
failedCfgBlkBitmask	uint32	optional	Bitmask of failed config blocks... TODO better to be repeated block enumerations? Included if there is anything failed.
meterResultCode	ResultCode	optional	Included if there was an issue communicating with the meter.
timestamp	uint32	optional	Timestamp
bootTime	uint32	optional	Boot time
retransmitNum	uint32	optional	Retransmit number
needsHashesAuthorized	bool	optional	Indicates EMCM will not be reporting data until authorization received. Always included.
endDeviceInfoHash	uint32	optional	Hash over end device info. Always included.
pwrFailTimestamp	uint32	optional	Last power fail timestamp
pwrRestoreTimestamp	uint32	optional	Last power restore timestamp
bootResult	BootResult	optional	Boot Result
meterSerialNum	string	optional	Meter Serial Number

3.2.1. Message: BootInd.BootDetails

Information about what caused the boot.

Field	Type	Rule	Description
bootReason	uint32	optional	TODO should this be an enum?
bootType	BootType	optional	
appResetReason	AppEvent	optional	
numWatchdogResets	uint32	optional	
programCounter	uint32	optional	
linkRegister	uint32	optional	
exceptionNum	uint32	optional	
faultStatus	uint32	optional	
faultStatusAux	uint32	optional	
filename	bytes	optional	
line	uint32	optional	
lastUptime	uint32	optional	
lastNetworkTime	uint32	optional	
lastBuildVersion	uint32	optional	
buildVersion	uint32	optional	

Field	Type	Rule	Description
rtcUptime	uint32	optional	
nodeExceptionHash	uint32	optional	
numValidPanicBlks	uint32	optional	
panicBlockSeqNum	uint32	optional	

3.3. Message: PrecisionU32

A semi-efficient way of communicating values with units.

Field	Type	Rule	Description
value	uint32	optional	The raw value.
mult	uint32	optional	Multiply by this to get the final value.
div	uint32	optional	Divide by this to get the final value.

3.4. Message: DataSchedule

Schedule definition.

Field	Type	Rule	Description
offsetSeconds	uint32	optional	The offset in seconds from midnight that the read and reporting periods will be shifted by.
offsetRelativeToLocalTime	bool	optional	If true then the read and reporting periods are relative to local midnight. If not then the periods are relative to UTC midnight.
readPeriodSeconds	uint32	optional	The period on which to to read data from the meter.
reportingPeriodSeconds	uint32	optional	The period to randomize the transmission of read data.
doDemandResetAfterRead	bool	optional	Enables billing data schedules to perform a demand reset.

3.5. Message: BillingDataOrder

Combination of a filter and a schedule for billing data.

Field	Type	Rule	Description
filter	BillingDataFilter	optional	Billing data filter.
schedule	DataSchedule	optional	Billing data read/report schedule.

Field	Type	Rule	Description
doDailyDemandReset	bool	optional	Perform a demand reset after the first read of billing data of the day.
doMonthlyDemandReset	bool	optional	Perform a demand reset at day and offset in each month
monthlyDemandResetOffsetInDay	uint32	optional	monthly offset in days

3.5.1. Message: BillingDataOrder.BillingDataFilter

Field	Type	Rule	Description
summationsFilter	bytes	optional	a bitmap of summation quanties to enable
demandsFilter	bytes	optional	a bitmap of demand quanties to enable
coincidentsFilter	bytes	optional	a bitmap of coincident quanties to enable
tiersFilter	bytes	optional	a bitmap of tiers to enable

3.6. Message: SetDataOrdersReq

Set Data Orders Req

Field	Type	Rule	Description
orderId	uint32	optional	An identifier of the entire data order.
billingDataOrders	BillingDataOrder	repeated	Billing data orders.
loadProfileDataOrders	LoadProfileDataOrder	repeated	Load profile data orders.
powerQualityEventOrder	PowerQualityEventOr	repeated	Power Quality event monitoring orders.
meterDataReportHash	bytes	optional	Hash over meter tables relevant to data reporting.
powerQualityReadingReportOrder	PowerQualityReportO	repeated	
flushOutstandingMeterData	bool	optional	Clear meter data stored in emcm flash
meterEventIndPollingPeriod	uint32	optional	MeterInd polling schedule [default = 300]
timeConfiguration	TimeConfiguration	optional	Time Configuration Override
meterFlagsIgnoreMask	MeterFlagsIgnoreMas	optional	Meter flags mask to filter out meter flag bits
meterCompletionScheduleBound	uint32	optional	Amount of time in seconds a procedure is allowed to end after the scheduled time [default = 45]
meterCompletionRetryInterval	uint32	optional	Retry interval

Field	Type	Rule	Description
			[default = 15]

3.6.1. Message: SetDataOrdersReq.LoadProfileDataOrder

Combination of a filter and a schedule for load profile data.

Field	Type	Rule	Description
set_deprecated	LoadProfileSet	optional	"set" has been deprecated and should no longer be used. Instead, the set number is based on the index of the loadProfileDataOrders field (where index=0 -> LP_SET_1, index=1 -> LP_SET_2, etc).
filter	LoadProfileDataFilter	optional	Load profile filter.
schedule	DataSchedule	optional	Load profile read/report schedule.
maxIntervalsPerReport	uint32	optional	Max number of intervals to report.
maxLpBacklogSec	uint32	optional	Max seconds of lp data backlog
loadProfileInitOffsetSec	uint32	optional	Num seconds of lp lookback upon boot [default = 3600]

3.6.1.1. Enum: SetDataOrdersReq.LoadProfileDataOrder.LoadProfileSet

Element	Value	Description
LP_SET_1	0	
LP_SET_2	1	
LP_SET_3	2	
LP_SET_4	3	

3.6.1.2. Message: SetDataOrdersReq.LoadProfileDataOrder.LoadProfileDataFilter

Field	Type	Rule	Description
channelFilter	bytes	optional	a bitmap of channel quanties to enable

3.6.2. Message: SetDataOrdersReq.PowerQualityEventOrder

Combination of a filter and a schedule for billing data.

Field	Type	Rule	Description
filter	PowerQualityEventFil	optional	Voltage event filtering
schedule	DataSchedule	optional	Voltage event read/report schedule.

3.6.2.1. Message: SetDataOrdersReq.PowerQualityEventOrder.PowerQualityEventFilter

Field	Type	Rule	Description
maxNumEvents	uint32	optional	How many recent events to report [default = 5]

3.6.3. Message: SetDataOrdersReq.PowerQualityReportOrder

Field	Type	Rule	Description
filter	PowerQualityReportFi	optional	Voltage event filtering
schedule	DataSchedule	optional	Voltage event read/report schedule.

3.6.3.1. Message: SetDataOrdersReq.PowerQualityReportOrder.PowerQualityReportFilter

Field	Type	Rule	Description
select	bytes	optional	Fields in PowerQualityReportRsp are to be included: bit 0 - LtoLVoltageMagnitude bit 1 - LtoNVoltageMagnitude bit 2 - currentMagnitude bit 3 - momentaryPF bit 4 - averagePF bit 5 - ITHD bit 6 - VTHD bit 7 - TDD bit 8 - distortionPF bit 9 - temperature bit 10 - frequency bit 11 - power KW DMD bit 12 - power KVAR DMD bit 13 - power distortion KVA bit 14 - power apparent KVA
select2	bytes	optional	Fields in PowerQualityReportRsp select2 are to be included:

Field	Type	Rule	Description
			bit 0 - voltage angles bit 1 - current angles

3.6.4. Message: SetDataOrdersReq.TimeConfiguration

Field	Type	Rule	Description
timeZoneOffset	int32	optional	Number of minutes relative to UTC time [default = 0]
dstTimeAmt	uint32	optional	Number of minutes that DST differs from standard time [default = 60]
dstOnEvent	uint32	optional	RDate of when the DST edge turns on
dstOffEvent	uint32	optional	RDate of when the DST edge turns off
dstTimeEff	uint32	optional	Number of seconds since midnight DST goes into effect [default = 7200]

3.6.5. Message: SetDataOrdersReq.MeterFlagsIgnoreMask

Used to set up which meter flags to filter out

Field	Type	Rule	Description
stdFlags	StandardMeterFlags	optional	
extraMfgFlags	bytes	optional	

3.7. Message: BillingDataTier

Field	Type	Rule	Description
tierNum	uint32	optional	The tier number (0 = total, 1 = tier A, ...)
summation	int64	repeated	TODO resize these when you solve the pre-encoded size issue Summation values (integer), in order as specified by the data orders. [packed = true]
demand	Demand	repeated	Demand values, in order as specified by the data orders.

Field	Type	Rule	Description
coincident	int64	repeated	Coincident values (integer), in order as specified by the data orders. [packed = true]
summationFloat	float	repeated	Summation values (floating point), in order as specified by the data orders. [packed = true]
coincidentFloat	float	repeated	Coincident values (float), in order as specified by the data orders. [packed = true]

3.7.1. Message: BillingDataTier.Demand

Field	Type	Rule	Description
value	int64	repeated	The demand value (integer).
eventTime	fixed32	repeated	
valueFloat	float	repeated	The demand value for (floating point).
cumulativeDemand	int64	repeated	cumulative demand value (integer)
cumulativeDemandFloat	float	repeated	cumulative demand value (floating point)

3.8. Message: BillingDataReq

* @brief Billing Data Req.

On-demand retrieval of billing data.

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID forrom the request.
order	BillingDataOrder	optional	Specifies what billing data to respond with.

3.9. Message: BillingDataInd

* @brief Billing Data Ind.

Field	Type	Rule	Description
resultCode	ResultCode	optional	
orderId	uint32	optional	The order ID in effect.

Field	Type	Rule	Description
billingDataOrderIdx	uint32	optional	Which billing data order this data fulfills.
timestamp	uint32	optional	POSIX timestamp of when the data was read or registered.
nbrDemandResets	uint32	optional	Number of demand resets executed by the device
tiers	BillingDataTier	repeated	The tiers of billing data, as specified by the data orders.
geI210PlusReading	GeI210PlusReading	repeated	
demandResetResultCode	ResultCode	optional	demand reset result code
currentSeason	uint32	optional	season value = 0-3

3.9.1. Message: BillingDataInd.GeI210PlusReading

Field	Type	Rule	Description
timestamp	uint32	optional	
summation	int64	repeated	
resultCode	ResultCode	optional	

3.10. Message: BillingDataRsp

* @brief Billing Data Rsp

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID from the request.
resultCode	ResultCode	optional	
timestamp	uint32	optional	POSIX timestamp of when the data was read or registered.
nbrDemandResets	uint32	optional	Number of demand resets executed by the device
tiers	BillingDataTier	repeated	The tiers of billing data, as specified by the request.
orderId	uint32	optional	
order	BillingDataOrder	optional	Indicates the Billing Data Order that was specified in the Billing Data Request that triggered this response. This field is not included if no such order was specified in the request.
currentSeason	uint32	optional	currentSeason

3.11. Message: PowerQualityReportReq

Power Quality Report Request

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID from the request.
selectFlags	uint32	optional	
selectFlags2	uint32	optional	

3.12. Message: PolyPhasePQquantity

General structure for representing a power quality measure

Field	Type	Rule	Description
value	int32	optional	
phase	uint32	optional	phase is defined as below: 1 => A-B or A-N depending on the context; 2 => B-C or B-N depending on the context; 3 => C-A or C-N depending on the context; 4 => N-G;
harmonicFlag	bool	optional	harmonicFlag when set indicates F+H, otherwise F only
numerator	int64	optional	
denominator	int64	optional	
invalidFlag	bool	optional	
element	uint32	optional	element is defined as below: 0 -> main + load 1 -> main 2 -> load

3.13. Message: ScaleInfo

Scalars that should be applied to different quantities not reported via UOMs

Field	Type	Rule	Description
voltageScaleFactor	ScaleFactor	optional	
currentScaleFactor	ScaleFactor	optional	
pfScaleFactor	ScaleFactor	optional	
hDistortionScaleFactor	ScaleFactor	optional	
freqScaleFactor	ScaleFactor	optional	
durationScaleFactor	ScaleFactor	optional	
activePowerScaleFactor	ScaleFactor	optional	
reactivePowerScaleFactor	ScaleFactor	optional	
apparentPowerScaleFactor	ScaleFactor	optional	

3.13.1. Message: ScaleInfo.ScaleFactor

ScaleFactor when applied to raw PQ values will give the final value in regular units (W,V,A,C,Hz)

Field	Type	Rule	Description
mult	uint32	optional	Multiply by this to get the final value
div	uint32	optional	Divide by this to get the final value

3.14. Message: PowerQualityReportRsp

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID from the request.
timestamp	fixed32	optional	
LtoLVoltageMagnitude	PolyPhasePQquantity	repeated	Line-to-line voltage values potentially for each of the 3 phase options and with/without harmonics
LtoNVoltageMagnitude	PolyPhasePQquantity	repeated	Line-to-neutral voltage values potentially for each of the 3 phase options and with/without harmonics
currentMagnitude	PolyPhasePQquantity	repeated	Current values potentially for each of the 3 phases (always LtoN) and with/without harmonics
momentaryPF	PolyPhasePQquantity	repeated	Momentary power factor per phase
averagePF	PolyPhasePQquantity	repeated	Average power factor per phase
ITHD	PolyPhasePQquantity	repeated	Current Total Harmonic Distortion
VTHD	PolyPhasePQquantity	repeated	Voltage Total Harmonic Distortion
TDD	PolyPhasePQquantity	repeated	Total Demand Distortion
distortionPF	PolyPhasePQquantity	repeated	Distortion Power Factor
temperature	int32	optional	Temperature
frequency	int32	optional	Frequency
activePowerW	PolyPhasePQquantity	repeated	Momentary Power Consumption KW
reactivePowerVAr	PolyPhasePQquantity	repeated	Momentary Power Consumption KVAR
distortionVA	PolyPhasePQquantity	repeated	Momentary Power Consumption Distortion KVA
apparentVA	PolyPhasePQquantity	repeated	Momentary Power Consumption Apparent KVA
voltageAngle	PolyPhasePQquantity	repeated	LSD Voltage angle
currentAngle	PolyPhasePQquantity	repeated	LSD Current angle

Field	Type	Rule	Description
resultCode	ResultCode	optional	

3.15. Message: EventRecord

Sag/swell record block

Field	Type	Rule	Description
eventType	EventRecordType	optional	
eventTime	fixed32	optional	
eventDuration	uint32	optional	
LtoNVoltageMagnitude	PolyPhasePQquantity	repeated	Only 3 values for 3 phases in case of current/voltage, harmonicFlag not included
currentMagnitude	PolyPhasePQquantity	repeated	
minLtoNVoltageMagnitude	PolyPhasePQquantity	optional	Min and max voltages (with respective phases if available) quantify voltage imbalance
maxLtoNVoltageMagnitude	PolyPhasePQquantity	optional	
frequency	uint32	optional	frequency included if the event indicates either under or over frequency threshold

3.15.1. Enum: EventRecord.EventRecordType

Element	Value	Description
SAG_EVENT	0	
SWELL_EVENT	1	
VOLTAGE_IMBALANCE_EVENT	2	
UNDER_FREQ_EVENT	3	
OVER_FREQ_EVENT	4	
MOMENTARY_OUTAGE_EVENT	5	

3.16. Message: EventInfo

Field	Type	Rule	Description
nbrEvents	uint32	optional	
cumNumEvents	uint32	optional	
firstEventTimestamp	fixed32	optional	
nbrEventInterruptions	uint32	optional	

3.17. Message: PowerQualityEventInd

Power Quality Event Indication

Field	Type	Rule	Description
timestamp	fixed32	optional	
sagInfo	EventInfo	optional	
swellInfo	EventInfo	optional	
voltageImbalanceInfo	EventInfo	optional	
underFrequencyInfo	EventInfo	optional	
overFrequencyInfo	EventInfo	optional	
momentaryOutageInfo	EventInfo	optional	
eventRecord	EventRecord	repeated	

3.18. Message: LineSideDiagnosticReq

Diagnostic Request Message to diagnose line-side issues

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID from the request.

3.19. Message: LineSideDiagnosticRsp

Line-side diagnostic information corresponds to line voltage and current on each phase and phase angles between each phase. Additionally may contain meter-specific diagnostic counts

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID from the request.
LtoNVoltageMagnitude	PolyPhasePQquantity	repeated	Line-to-neutral voltage values potentially for each of the 3 phase options (no harmonic info)
currentMagnitude	PolyPhasePQquantity	repeated	
voltageAngle	PolyPhasePQquantity	repeated	
currentAngle	PolyPhasePQquantity	repeated	
diagCounts	bytes	optional	

3.20. Message: StandardMeterFlags

Field	Type	Rule	Description
edModeBfld	uint32	optional	
edStdStatus1Bfld	uint32	optional	
edStdStatus2Bfld	uint32	optional	
edMfgStatusBfld	bytes	optional	

3.21. Message: MeterFlagInd

Meter Flag Ind

Field	Type	Rule	Description
resultCode	ResultCode	optional	
timestamp	uint32	optional	
stdFlags	StandardMeterFlags	optional	
extraMfgFlags	bytes	optional	

3.22. Message: MeterFlagReq

Meter Flag Req

Field	Type	Rule	Description
corrId	uint32	optional	

3.23. Message: MeterFlagRsp

Meter Flag Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
stdFlags	StandardMeterFlags	optional	
extraMfgFlags	bytes	optional	

3.24. Message: MeterFlagClearReq

Meter Flag Clear Req

Field	Type	Rule	Description
corrId	uint32	optional	
stdFlags	StandardMeterFlags	optional	
extraMfgFlags	bytes	optional	

3.25. Message: MeterFlagClearRsp

Meter Flag Clear Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	

3.26. Message: LoadProfileInterval

Load profile interval

Field	Type	Rule	Description
timestamp	uint32	optional	POSIX timestamp of the interval.

Field	Type	Rule	Description
channelValues	int32	repeated	The channel data in order as specified by the data orders. [packed = true]
commonIntStatus	bytes	optional	
channelStatus	bytes	optional	

3.27. Message: LoadProfileReq

On demand retrieval of load profile

Field	Type	Rule	Description
corrId	uint32	optional	Correlation ID
startTime	uint32	optional	Start of date range
endTime	uint32	optional	End of date range
lpSet	uint32	optional	LP Set (same as loadProfileOrderIdx)

3.28. Message: LoadProfileRsp

Load Profile Response

Field	Type	Rule	Description
corrId	uint32	optional	Correlation ID
resultCode	ResultCode	optional	
timestamp	uint32	optional	POSIX timestamp of when the data was read or registered
orderId	uint32	optional	Order ID in effect
loadProfileOrderIdx	uint32	optional	Which load profile order this data fulfills.
intervals	LoadProfileInterval	repeated	The intervals being reported.

3.29. Message: LoadProfileInd

Sent autonomously by EMCM. Contains load profile data.

Field	Type	Rule	Description
resultCode	ResultCode	optional	
orderId	uint32	optional	The order ID in effect.
loadProfileOrderIdx	uint32	optional	Which load profile order this data fulfills.
timestamp	uint32	optional	POSIX timestamp of when the data was read or registered.

Field	Type	Rule	Description
intervals	LoadProfileInterval	repeated	The intervals being reported.

3.30. Message: RelayOperationReq

Sent by HES to request a change to a relay.

Field	Type	Rule	Description
corrId	uint32	optional	
timeToLive	uint32	optional	Time-to-live in seconds for the operations.
operation	RelayOperation	repeated	EMCM only accepts one relay operation at a time.
armToConnect	bool	optional	Exercise meter's relay arming feature for connect operations.
relayStateCheckDelay	uint32	optional	Amount of time to wait (in seconds) after operation completion to send up the relay state indication message [default = 15]
disableOverride	bool	optional	disableOverride for sgm3000 platform

3.30.1. Message: RelayOperationReq.RelayOperation

Field	Type	Rule	Description
relay	uint32	optional	
desiredState	RelayState	optional	

3.31. Message: RelayOperationRsp

Sent by EMCM in response to a RelayOperationReq.

Field	Type	Rule	Description
corrId	uint32	optional	Correlation ID.
actionInfo	RelayActionInfo	repeated	List of relay operations' results.
resultCode	ResultCode	optional	Overall result code for the operations.
timestamp	uint32	optional	POSIX time when the operations completed.

3.31.1. Message: RelayOperationRsp.RelayActionInfo

Field	Type	Rule	Description
relay	uint32	optional	
resultCode	ResultCode	optional	

3.32. Message: RelayStateInfo

Field	Type	Rule	Description
relay	uint32	optional	TODO should this be a logical enum?
sensedState	RelayState	optional	
currentState	RelayState	optional	
pendingState	RelayState	optional	
lastConnectCommandStatus	CommandStatus	optional	

3.32.1. Enum: RelayStateInfo.CommandStatus

Element	Value	Description
COMMAND_STATUS_DISCONNEC	0	
COMMAND_STATUS_CONNECT_(	1	
COMMAND_STATUS_COMMAND	2	
COMMAND_STATUS_UNKNOWN	3	

3.33. Message: RelayStateInd

Sent autonomously by EMCM when a relay's state changes.

Field	Type	Rule	Description
resultCode	ResultCode	optional	Overall result code for reading the relay state.
timestamp	uint32	optional	POSIX time when the operation is completed
stateInfo	RelayStateInfo	repeated	Included if this is an indication and not a response.

3.34. Message: RelayStateReq

Relay State Req

Field	Type	Rule	Description
corrId	uint32	optional	

3.35. Message: RelayStateRsp

Relay State Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	Overall result code for reading the relay state.

Field	Type	Rule	Description
stateInfo	RelayStateInfo	repeated	The relay(s) state.

3.36. Message: AppEventInd

App Event Ind

Field	Type	Rule	Description
events	AppEventInfo	repeated	List of app events.

3.36.1. Message: AppEventInd.AppEventInfo

Field	Type	Rule	Description
event	AppEvent	optional	The event that is being reported.
state	AppEventState	optional	The event state.
timestamp	uint32	optional	POSIX time associated with the event or its state change.

3.36.1.1. Enum: AppEventInd.AppEventInfo.AppEventState

Element	Value	Description
SET	0	For stateful events, that the event is active.
CLEAR	1	For stateful events, that the event is inactive.
OCCURRED	2	For unstate events, that the event happened.

3.37. Message: ErrorInd

Error Ind -- Generic error indication.

Field	Type	Rule	Description
timestamp	uint32	optional	
resultCode	ResultCode	optional	
corrId	uint32	optional	
errData	uint32	optional	

3.38. Message: MeterCommErrorInd

Meter Comm Error Ind

Field	Type	Rule	Description
timestamp	uint32	optional	

Field	Type	Rule	Description
meterCommError	MeterCommError	repeated	

3.38.1. Message: MeterCommErrorInd.MeterCommError

Field	Type	Rule	Description
index	uint32	optional	
service	Service	optional	
errCode	ErrorCode	optional	
tableType	MeterTableType	optional	
tableId	uint32	optional	
offset	uint32	optional	
length	uint32	optional	

3.38.1.1. Enum: MeterCommErrorInd.MeterCommError.Service

Element	Value	Description
IDENTIFICATION	0	
NEGOTIATE	1	
LOGON	2	
SECURITY	3	
READ_TABLE	4	
WRITE_TABLE	5	
TERMINATE	6	

3.38.1.2. Enum: MeterCommErrorInd.MeterCommError.ErrorCode

Element	Value	Description
ERROR	0	
SERVICE_NOT_SUPPORTED	1	
INSUFFICIENT_SECURITY_CLEAF	2	
OPERATION_NOT_POSSIBLE	3	
INAPPROPRIATE_ACTION_REQUI	4	
DEVICE_BUSY	5	
DATA_NOT_READY	6	
DATA_LOCKED	7	
RENEGOTIATE_REQUEST	8	
INVALID_SERVICE_SEQUENCE_S	9	

3.39. Message: GetMeterInfoReq

Get Meter Info Req

Field	Type	Rule	Description
corrId	uint32	optional	

3.40. Message: GetFlagsReq

Get Flags Req

Field	Type	Rule	Description
corrId	uint32	optional	

3.41. Message: ResetDeviceReq

Reset Device Req

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID of the request.
deviceMask	uint32	optional	Mask of devices to reset: bit 0 = EMCM processor, bit 1 = node, bit 2 = ZigBee module
resetMagic	uint32	optional	Must match a super secret value to take effect. [default = 38749]
eraseDataOrders	bool	optional	Should we erase the data orders?
clearPostFail	bool	optional	Should we clear post fail condition?
flushOutstandingMeterData	bool	optional	Clear all meter data in emcm flash
reformatDomBlock	bool	optional	Erase external flash
eraseCountsBlock	bool	optional	Erase internal counts block

3.42. Message: ResetDeviceRsp

Reset Device Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
deviceMask	uint32	optional	
eraseDataOrders	bool	optional	
clearPostFail	bool	optional	
flushOutstandingMeterData	bool	optional	
reformatDomBlock	bool	optional	
eraseCountsBlock	bool	optional	

3.43. Message: ReadMeterTableReq

Read Meter Table Req

Field	Type	Rule	Description
corrId	uint32	optional	
tableType	MeterTableType	optional	
tableNum	uint32	optional	
full	bool	optional	
offset	uint32	optional	
maxLength	uint32	optional	
takeSnapshot	uint32	optional	

3.44. Message: ReadMeterTableRsp

Read Meter Table Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
tableType	MeterTableType	optional	
tableNum	uint32	optional	
full	bool	optional	
offset	uint32	optional	
maxLength	uint32	optional	
tableData	bytes	optional	

3.45. Message: WriteMeterTableReq

Write Meter Table Req

Field	Type	Rule	Description
corrId	uint32	optional	
action	Action	optional	
tableType	MeterTableType	optional	
tableNum	uint32	optional	
full	bool	optional	
offset	uint32	optional	
tableData	bytes	optional	TODO max size? Code seems to not bound this (probable buffer overflow)

3.45.1. Enum: WriteMeterTableReq.Action

Element	Value	Description
FLUSH	0	Flush current queue and enqueue this write.
QUEUE	1	Enqueue this write.
EXECUTE	2	Execute the enqueued writes (including the write specified in this message).
STOP_PROGRAMMING	3	Execute the enqueued writes (including the write specified in this message) and finishes with a stop programming procedure.

3.46. Message: WriteMeterTableRsp

Write Meter Table Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
tableType	MeterTableType	optional	
tableNum	uint32	optional	
full	bool	optional	
offset	uint32	optional	
length	uint32	optional	

3.47. Message: StartMeterProcecureReq

Start Meter Procedure Req

Field	Type	Rule	Description
corrId	uint32	optional	
procType	MeterProcedureType	optional	
procNum	uint32	optional	
procData	bytes	optional	

3.48. Message: StartMeterProcecureRsp

Start Meter Procedure Rsp

Field	Type	Rule	Description
resultCode	ResultCode	optional	
corrId	uint32	optional	
procType	MeterProcedureType	optional	
procNum	uint32	optional	

Field	Type	Rule	Description
length	uint32	optional	

3.49. Message: SetConfigReq

SetConfigReq

Field	Type	Rule	Description
corrId	uint32	optional	
configValues	ConfigValues	optional	
configBlock	bytes	optional	

3.49.1. Message: SetConfigReq.ConfigValues

Field	Type	Rule	Description
timeSyncPeriod	uint32	optional	Period at which the application gets time sync from the Node.
sendDebugAsync	uint32	optional	Configuration related to the Debug Logs and Debug Counters Inds.
sendDebugPeriod	uint32	optional	
loadProfileReportingPeriod	uint32	optional	deprecated
loadProfileInitOffset	uint32	optional	deprecated
bulkReadPeriod	uint32	optional	deprecated
bulkReadOffset	uint32	optional	deprecated
bulkReportingPeriod	uint32	optional	deprecated
includeRaw	bool	optional	deprecated
checkConnectStateTimeout	uint32	optional	Configuration related to the Connect/Disconnect Req/Rsp.
meterInfoRetryInterval	uint32	optional	Configuration related to the Meter Info Ind/Cnf.
debugTimeOffset	int32	optional	Offset to apply to time received from the Node. This is for debug only.
meterTimeAlarmThreshold	uint32	optional	Time diff at which an alarm is generated.
meterTimeSetAllowed	bool	optional	Notes if the app is allowed to set the time if the there is a meter time alarm.
ledPattern	uint32	optional	LED configuration parameters.
deploymentLedPatternTimeout	uint32	optional	
meterFlagsPollIntervalSec	uint32	optional	Configuration related to the Meter Flags Ind/Cnf.
meterFlagsRetryIntervalSec	uint32	optional	

Field	Type	Rule	Description
appEventsRetryIntervalSec	uint32	optional	Configuration related to the App Events Ind/Cnf.
relayStatePollIntervalSec	uint32	optional	Configuration related to the Relay State Ind/Cnf.
relayStateRetryIntervalSec	uint32	optional	
appInactivityMult	uint32	optional	Inactivity multiplier.
password	bytes	optional	Meter password.
testMode	uint32	optional	0 - Test mode disabled. 1 - Factory test mode, not persistent. 2 - Factory test mode, persistent. 3 - TX test mode, not persistent. 4 - TX test mode, persistent.
txTestMode	uint32	optional	
txTestAntenna	uint32	optional	
txTestCenterFreqKhzOffset	uint32	optional	
txTestVga	uint32	optional	
txTestModeSec	uint32	optional	
txTestModeUsec	uint32	optional	
commBusyBackoff	uint32	optional	
meterHandshakeNumUsec	uint32	optional	
chargeCapDelaySec	uint32	optional	Delay in seconds before (re)starting super cap charging.
bulkStoredEntriesMax	uint32	optional	Maximum number of bulk entries (unacked backlog) stored in BDS.
maxMomentaryOutageDurationSe	uint32	optional	Max seconds since start of powerfail before commiting to last gasp.
maxMomentaryInterruptionDurati	uint32	optional	Max duration of any interruption before commiting to last gasp.
minPowerOnDurationMsec	uint32	optional	Min duration of restoration before declaring the outage recovered.
uspAckReqInterval	uint32	optional	Consecutive number of empty ustream heartbeats to wait before explicitly requesting a ustream ACK.

3.50. Message: SetConfigRsp

SetConfigRsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	

3.51. Message: GetConfigValueReq

Get Config Values Req

Field	Type	Rule	Description
corrId	uint32	optional	

3.52. Message: GetConfigValueRsp

Get Config Values Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
value	bytes	optional	

3.53. Message: PanicBlockReq

Panic Block Req

Field	Type	Rule	Description
corrId	uint32	optional	
index	uint32	optional	
raw	bool	optional	[default = false]

3.54. Message: PanicBlockRsp

Panic Block Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
index	uint32	optional	
panicBlockSeqNum	uint32	optional	
panicBlocks	PanicBlock	repeated	
rawPanicBlocks	RawPanicBlock	repeated	

3.54.1. Message: PanicBlockRsp.PanicBlock

Field	Type	Rule	Description
valid	bool	optional	
version	uint32	optional	
exceptionNum	uint32	optional	
filename	string	optional	
line	uint32	optional	

Field	Type	Rule	Description
desc	string	optional	
uptime	uint32	optional	
networkTime	uint32	optional	
buildStamp	string	optional	
buildVersion	uint32	optional	
bootReason	uint32	optional	
numWatchdogResets	uint32	optional	
programCounter	uint32	optional	
linkRegister	uint32	optional	
faultStatus	uint32	optional	
faultStatusAux	uint32	optional	

3.54.2. Message: PanicBlockRsp.RawPanicBlock

Field	Type	Rule	Description
rawBytes	bytes	optional	

3.55. Message: ClearPanicBlocksReq

Clear Panic Blocks Req

Field	Type	Rule	Description
corrId	uint32	optional	

3.56. Message: SeasonChangeReq

Season Change Req

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID forrom the request.
seasonNum	uint32	optional	season num 0,1,2,3
startTime	uint32	optional	start time for Season change req [default = 0]
endTime	uint32	optional	end time for Season change req [default = 0]

3.57. Message: SeasonChangeRsp

Season Change Rsp

Field	Type	Rule	Description
corrId	uint32	optional	

Field	Type	Rule	Description
resultCode	ResultCode	optional	

3.58. Message: RtpChangeReq

RTP Change Req

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID forrom the request.
rtpNum	uint32	optional	rtp num -- 0,1
startTime	uint32	optional	start time for RTP change req [default = 0]
endTime	uint32	optional	end time for RTP change req [default = 0]

3.59. Message: RtpChangeRsp

RTP Change Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	

3.60. Message: DemandResetReq

Demand Reset Req

Field	Type	Rule	Description
corrId	uint32	optional	
startTime	uint32	optional	start time for demand reset [default = 0]
endTime	uint32	optional	end time for demand reset [default = 0]
returnDemandData	bool	optional	if true return demand data
returnCoincidentData	bool	optional	if true return coincident data

3.61. Message: DemandResetRsp

Demand Reset Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	

Field	Type	Rule	Description
tiers	BillingDataTier	repeated	The billing data demand and coincidents if indicated in the request.

3.62. Message: GetMcmUptimeReq

Get Mcm Uptime Req

Field	Type	Rule	Description
corrId	uint32	optional	

3.63. Message: GetMcmUptimeRsp

Get Mcm Uptime Rsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
uptimeSec	uint32	optional	
rtcUptime	uint32	optional	
bootTime	uint32	optional	
timestamp	uint32	optional	

3.64. Message: MeterConfigReportReq

MeterConfigReportReq

Field	Type	Rule	Description
corrId	uint32	optional	

3.65. Message: EndDeviceInfoReq

EndDeviceInfoReq

Field	Type	Rule	Description
corrId	uint32	optional	

3.66. Message: EndDeviceInfoRsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
emcmInfo	EmcmInfo	optional	Information about the emcm
meterInfoStandard	StandardMeterSpecific	optional	Information about the meter (serial number, etc).

Field	Type	Rule	Description
meterInfoManufacturer	ManufacturerMeterSpe	optional	Information about specific GE meters (meter mode, program ID, etc)
meterInfoGeI210Plus	GeI210PlusMeterSpec	optional	Information about the meter (GE i210+ specific).
endDeviceInfoHash	uint32	optional	Hash over end device info. This value should match what is stored in BootInd.endDeviceInfoHash. Always included.

3.66.1. Message: EndDeviceInfoRsp.EmcmInfo

EMCM build/processor info.

Field	Type	Rule	Description
fwBoardType	BoardType	optional	The board that the EMCM software was compiled for.
fwMeterType	MeterType	optional	The meter that the EMCM software was compiled for.
fwVerMajor	uint32	optional	EMCM software version information.
fwVerMinor	uint32	optional	EMCM software version information.
fwVerBuild	uint32	optional	EMCM software version information.
fwBuildType	EmcmBuildType	optional	EMCM software build type.
buildStamp	string	optional	The EMCM software build stamp string.
cpuId	bytes	optional	Unique identifier of the EMCM main processor.
emcmId	bytes	optional	Provisioned unique identifier for this EMCM.
jedecId	uint32	optional	JEDEC ID

3.66.2. Message: EndDeviceInfoRsp.StandardMeterSpecificInfo

Meter info for most meters.

Field	Type	Rule	Description
meterType	MeterType	optional	Meter type that the EMCM software was compiled against.
mfgCode	string	optional	From ST1 MANUFACTURER field.
modelName	string	optional	From ST1 ED_MODEL field.
hwVer	uint32	optional	From ST1 HW_VERSION_NUMBER field.

Field	Type	Rule	Description
hwRev	uint32	optional	From ST1 HW_REVISION_NUMBER field.
fwVer	uint32	optional	From ST1 FW_VERSION_NUMBER field.
fwRev	uint32	optional	From ST1 FW_REVISION_NUMBER field.
serialNum	string	optional	From ST1 MFG_SERIAL_NUMBER field.
meterId	string	optional	From ST5 METER_ID field.

3.66.3. Message: EndDeviceInfoRsp.ManufacturerMeterSpecificInfo

Meter info that differs for each GE meter

Field	Type	Rule	Description
programId	uint32	optional	From MT67 PROGRAM_ID field
meterMode	uint32	optional	From MT0 METER_MODE field
upgradesBfld	uint32	optional	From MT0 UPGRADES_BFLD field
elementVolts	uint32	optional	From ST2 E_VOLTS_BFLD
eClassMaxAmps	bytes	optional	From ST2 E_CLASS_MAX_AMPS (SGM/ i210c)
numElements	uint32	optional	From ST2 E_NO_OF_ELEMENTS (i210+c only)
maxClassAmps	uint32	optional	From MT87 MAX_CLASS_AMPS (kV2c only)

3.66.4. Message: EndDeviceInfoRsp.GeI210PlusMeterSpecificInfo

Meter info specific for GE i210+ meter.

Field	Type	Rule	Description
meterType	MeterType	optional	
mode	GeI210PlusMeterMod	optional	
serviceType	GeI210PlusServiceTyp	optional	
fwPartNumber	bytes	optional	
fwGroupNumber	bytes	optional	
fwVersionNumber	uint32	optional	
fwRevisionNumber	uint32	optional	
fwBuildNumber	uint32	optional	

Field	Type	Rule	Description
fwIdentification	uint32	optional	

3.66.4.1. Enum: EndDeviceInfoRsp.GeI210PlusMeterSpecificInfo.GeI210PlusMeterMode

Element	Value	Description
FACTORY	0	
METER	1	

3.66.4.2. Enum: EndDeviceInfoRsp.GeI210PlusMeterSpecificInfo.GeI210PlusServiceType

Element	Value	Description
TYPE_1S_OR_3S_1_PHASE_2_WIR	0	
TYPE_2S_OR_4S_1PHASE_3WIRE	1	
TYPE_12S_OR_25S	2	

3.67. Message: MeterConfigReportRsp

MeterConfigReportRsp

Field	Type	Rule	Description
corrId	uint32	optional	
resultCode	ResultCode	optional	
meterDataReportHash	bytes	optional	Hash over meter tables relevant to data reporting.
summationUoms	Uom	repeated	UOM information for summations.
demandUoms	Uom	repeated	UOM information for demands.
coincidentUoms	Uom	repeated	UOM information for concidents.
coincDemandAssoc	bytes	optional	Each of the coincident is associated with a demand index
loadProfileSetUoms	LpSetUoms	repeated	UOM information for load profile channels.
loadProfileMaxIntTime	uint32	repeated	
meterType	MeterType	optional	Meter type that the EMCM software was compiled against.
relayPresent	uint32	optional	Bitfield of the relays included with this meter
demandMinMaxFlags	bytes	optional	Demand min/max flags (MIN_OR_MAX_FLAGS from ST22).

Field	Type	Rule	Description
numBillingDataTiers	uint32	optional	NBR_TIERS from ST21.
pqScaleInfo	ScaleInfo	optional	
armingAllowed	uint32	optional	Bitfield of which relays allow arming [default = 0]

3.67.1. Message: MeterConfigReportRsp.Uom

Unit of measure.

Use of multiplier/divisor/offset fields:

final(x) = ((mult*x + offset)/div)

Field	Type	Rule	Description
uom	uint32	optional	Unit of measure (UOM) from C12.19 ST12
nfs	bytes	optional	C12.19 ST14 bytes to illuminate a not-fully-specified UOM. Included if UOM has NFS bit set.
mult	uint32	optional	Multiplier.
div	uint32	optional	Divisor.
offset	uint32	optional	Standard offset.

3.67.2. Message: MeterConfigReportRsp.LpSetUoms

Field	Type	Rule	Description
uoms	Uom	repeated	

3.67.3. Message: MeterConfigReportRsp.RelayDescription

Field	Type	Rule	Description
name	string	optional	

3.68. Message: RelayInfo

Field	Type	Rule	Description
resultCode	ResultCode	optional	
actionInfo	RelayActionInfo	repeated	Not included in some contexts.
timeStamp	uint32	optional	POSIX time when information was read. Not included in some contexts.
stateInfo	RelayStateInfo	repeated	

3.68.1. Message: RelayInfo.RelayActionInfo

Field	Type	Rule	Description
relay	uint32	optional	
resultCode	ResultCode	optional	

3.69. Message: HandleErrorReq

Field	Type	Rule	Description
meterResultCode	ResultCode	optional	the error code to send down to EMCM (currently only CFG_UNKNOWN_ASSOCIATION is valid)

3.70. Message: MeterInd

Field	Type	Rule	Description
relayState	RelayStateInd	optional	
meterFlag	MeterFlagInd	optional	

3.71. Message: C1219Req

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID for the request.
startTime	fixed32	optional	Posix start time to execute C1219Req - if not set, start immediately
expiryTime	fixed32	optional	Posix expire time to halt any C1219 Req processing - if not set, never expire
numRetries	uint32	optional	Number of times to attempt C1219Req programming - if not set, no retries NOTE: The MCM will limit cap numRetries at 7.
rspVerbosityType	C1219RspVerbosityTy	optional	The response verbosity of the C1219Rsp - if not set, the MCM will use the C1219_RSP_VERBOSITY_TYPE_FAILURE_DET setting when it generates the C1219Req message.
retryDelay	uint32	optional	The retry delay in between C1219Req program attempts - if not set, the MCM will use a a default delay value of 15seconds between attempts.
operations	C1219Operation	repeated	A chained list of C1219 Operation request to be executed in order

3.71.1. Message: C1219Req.C1219Operation

Field	Type	Rule	Description
action	C1219Action	optional	The C12.19-level action to perform.
actionType	C1219ActionType	optional	The actionType to further refine how the program operation is processed - if not defined, the default is a standard PROGRAM_AND_READ action type.
patchType	C1219PatchType	optional	The patch type - only applicable to PATCH operations.
type	MeterTableType	optional	The type of table or procedure to act on.
number	uint32	optional	The table or procedure number to act on for READ_*, WRITE_*, PROCEDURE actions.
isFull	bool	optional	For READ_* and WRITE_* actions, explicitely define if it is a FULL action
offset	uint32	optional	The offset to read from or write to for READ_PARTIAL, WRITE_PARTIAL, PATCH, or READ_MODIFY_BITFIELD_WRITE actions.
maxLength	uint32	optional	For READ_FULL action this is the maximum data to respond with. For READ_PARTIAL action this is the size of the partial read. For a PATCH action, this is the size of the patch data to replace with run-time C12.19 data
delayMsec	uint32	optional	A delay value, in Msec, for the DELAY action
hexBitFieldMask	uint32	optional	A hex bitfield mask for the READ_MODIFY_BITFIELD_WRITE action - although declared in protobuf as a variable-sized uint32, only 8-bit hex values are accepted by target firmware.
hexBitFieldValue	uint32	optional	A hex bitfield value for the READ_MODIFY_BITFIELD_WRITE action that will replace the bits specified in the hexBitFieldMask tags - obviously, the value must be

Field	Type	Rule	Description
			in the specified range. ONLY the '1'-bits set in the hexBitFieldMask are updated with this this field.
tableData	bytes	optional	Included for WRITE_FULL, WRITE_PARTIAL, PROCEDURE actions. NOTE: The gap/offset in tag ID for the table data is intentional - this allows the insertion of other operation data into the C1219 Req message proto while maintaining backward compatibility with previous operation definitions.
validation	C1219Validation	optional	Program validation data - required for COMPATIBLITY and AUDIT action types, ignored by STANDARD actions or C12.19-level accesses that do not include meter response data (i.e., a WRITE_* operation) - NOTE: Multiple validation options are allowed/checked, but common sense needs to prevail when determining the range checks.

3.71.1.1. Message: C1219Req.C1219Operation.C1219Validation

Field	Type	Rule	Description
isNot	bool	optional	This flag essentially inverts the validation conditional logic check of all validation statements - e.g., integerReadData != number, readHexString != hexStringCompare will result in a sucessful validation check when isNot==1. If not defined, isNot is assumed to be false.
number	int64	optional	The C12.19 operation response is converted to an integer and must equate to the following value to pass the validation step
rangeLower	int64	optional	The C12.19 operation response is converted to an integer and cannot be less than the specified lower range value.
rangeUpper	int64	optional	The C12.19 operation response is converted to an integer and cannot be more than the specified upper range value.

Field	Type	Rule	Description
isBitTest	bool	optional	This flag essentially changes the hexStringCompare array as a bitwise AND operation (as opposed to a straightup byte compare) - combined with the isNot flag, this provides the capability to check/test individual bits of a given byte array read response.
hexStringCompare	bytes	optional	The C12.19 operation response must match the specified hex string using either a standard strcmp, or if isBitwiseCheck == true, a bit test operation.
hexBitFieldMask	uint32	optional	An alternative C12.19 Program Validation method can be used to test bitfields within a single table byte. However, there are a couple of restrictions regarding how this is set up in the validation submessage: - HexStringCompare array cannot be defined (it will trump any tags that follow it). - If the associated READ operation contains multiple read bytes (FULL or PARTIAL), only the first bytes is tested with the specified bitFieldMask. Is is expected that the corresponding table read is a PARTIAL single byte read (at a specified offset) - The hexBitFieldMask cannot span multiple byte boundries and is obviously limited to an 8-bit mask (i.e., any MSB above 0xFF are dropped). - The bitFieldValue is always tested as an integer. Obviously, it only makes sense if it is in the range of the set by the BitMask. - hexBitFieldMask and bitFieldValue must BOTH be defined (or it is treated as a validation decode failure)
bitFieldValue	uint32	optional	

3.72. Message: C1219Rsp

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID from the request.

Field	Type	Rule	Description
startTime	uint32	optional	POSIX timestamp of when the device started servicing the request.
numRetries	uint32	optional	Max number of times to attempt C1219Req programming NOTE: The MCM will limit cap numRetries at 7.
rspVerbosityType	C1219RspVerbosityTy	optional	The response verbosity of the C1219Rsp (i.e., this message)
results	C1219OperationResult	repeated	
resultCode	ResultCode	optional	The overall result code.
endTime	uint32	optional	POSIX timestamp of when the device finished the request.
numRetriesUsed	uint32	optional	Number of times program retried from start (0 or not defined - single pass)

3.72.1. Message: C1219Rsp.C1219OperationResult

Field	Type	Rule	Description
action	C1219Action	optional	The action that was requested.
actionType	C1219ActionType	optional	The actionType to further refine how the program operation was processed - if not defined, the default is a standard PROGRAM_AND_READ action type.
patchType	C1219PatchType	optional	The patch type - only applicable to PATCH operations.
type	MeterTableType	optional	The type of table or procedure to act on.
number	uint32	optional	The table or procedure number to act on for READ_*, WRITE_* actions.
isFull	bool	optional	For READ_* and WRITE_* actions, explicitely define if it is a FULL or PARTIAL action
offset	uint32	optional	The offset to read from or write to for READ_PARTIAL, WRITE_PARTIAL, or PATCH actions.
maxLength	uint32	optional	For READ_FULL action this is the maximum data to respond with. For READ_PARTIAL action this is the size of the partial read.

Field	Type	Rule	Description
			For a PATCH action, this is the size of the patch data to replace with run-time C12.19 data
C1218ErrorCode	uint32	optional	C12.18 Error code.
C1219ProcedureErrorCode	uint32	optional	Result Code in Standard Table 8
C1219ProcedureRespRcd	bytes	optional	Procedure Response Record in Standard Table 8
delayMsec	uint32	optional	A delay value, in Msec, for the DELAY action
OperationAmiFailureCode	ResultCode	optional	Operation AMI definition result code
tableData	bytes	optional	Included for READ_FULL, READ_PARTIAL; NOTE: The gap/offset in tag ID for the table data is intentional - this allows the insertion of other operation data into the C1219 Rsp message proto while maintaining backward compatibility with previous result definitions.

3.73. Message: C1219AbortReq

Field	Type	Rule	Description
corrId	uint32	optional	The correlation ID of the C1219Req/Rsp to abort. If not specified, this aborts/cancels the current request regardless of corrId.

3.74. Enum: DisplayHintEnum

Element	Value	Description
NONE	0	
SW_VERSION	1	
INT_AS_HEX32	2	
INT_AS_HEX16	3	
INT_AS_HEX8	4	
BYTES_AS_HEX	5	
INT_AS_TIMESTAMP	6	
INT_AS_POSIX_TIME	7	

3.75. Enum: RelayState

Element	Value	Description
RELAY_STATE_UNKNOWN	0	Unknown, probably because communication with the meter failed.
RELAY_STATE_CONNECTED	1	Relay is closed.
RELAY_STATE_DISCONNECTED	2	Relay is open.
RELAY_STATE_NO_RELAY_PRES	3	What relay?

3.76. Enum: C1219Action

Enumeration of possible actions for C12.19-level accesses.

Element	Value	Description
C1219_ACTION_NIL	0	
C1219_ACTION_READ	1	A C12.18 table read (FULL or PARTIAL based on supplemental operation fields).
C1219_ACTION_WRITE	2	A C12.18 table write (FULL or PARTIAL based on supplemental operation fields).
C1219_ACTION_PROCEDURE	3	A C12.19 procedure call (via ST7 table write).
C1219_SET_TIME	4	A C12.19 SP10 with variables as determined at other times - NOTE: This action is decprecated and NOT supported on EMCM - Meter Time is set using a LOCAL_TIME PATCH action preceeding an appropriate PROCEDURE (i.e., SP10 or other MFG Procedure). DEPRECATED
C1219_DELAY	5	A delay operation to enforce between C12.19-level accesses by EMCM
C1219_PATCH	6	A C12.19 patch operation to preceed a WRITE or PROCEDURE action to allow the host to replace a segment of table data with run-time data from a C12.19 level access
C1219_READ_MODIFY_BITFIELD_	7	A C12.19 table read-modify-write in which a specified bitfield (offset and mask) is modified with a specified bitfield value. These READ/WRITE table actions are always PARTIAL and only operate on a single specified byte (by offset) within a specified Meter table. The other bitfieds in the Table byte are unchanged by this operation

3.77. Enum: C1219ActionType

Enumeration of action types that further clarify how a C12.19-level accesses is post-processed by the EMCM

Element	Value	Description
C1219_ACTION_TYPE_NIL	0	
C1219_ACTION_TYPE_PROGRAM_	1	A standard C12.19 action, executed without followup validation
C1219_ACTION_TYPE_COMPATIB	2	A C12.19 action that contains a COMPATIBILITY_TEST - usually associated with read operation that needs to be compared with validation data before permitting subsequent C12.19 actions to execute
C1219_ACTION_TYPE_AUDIT_TES	3	A C12.19 action that contains an AUDIT_TEST - executed following all standard actions and used to verify the C1219 Program Sequence is successful. As with the COMPATIBILITY_TEST, this is usually executed as a read operation that is compared with validation data

3.78. Enum: C1219PatchType

Enumeration of patch types that allow the EMCM to patch/replace a substring in the table data of a C1219_ACTION_WRITE or C1219_ACTION_PROCEDURE with run-time determined data.

Element	Value	Description
C1219_PATCH_TYPE_NIL	0	
C1219_PATCH_TYPE_LOCAL_TIM	1	C12.19 Local Time Patch

3.79. Enum: C1219RspVerbosityType

Enumeration of the response verbosity type that specifies how the MCM will build the C1219Rsp message.

Element	Value	Description
C1219_RSP_VERBOSITY_TYPE_NI	0	
C1219_RSP_VERBOSITY_TYPE_M	1	C12.19 Minimal verbosity response type - only the overall C1219 Program Sequence result code is returned
C1219_RSP_VERBOSITY_TYPE_FA	2	C12.19 Operation Failure details response type - in addition to the overall C1219 Program Result, the MCM will details on each failed C12.19 Operation.
C1219_RSP_VERBOSITY_TYPE_M	3	C12.19 Maximum verbosity response type - in addition to the overall

Element	Value	Description
		C1219 Program Result, the MCM will provide details on all C12.19 Operations.

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References

[1] Google Developers. *Protocol Buffers*. https://developers.google.com/protocol-buffers/. Google, Inc. 2 April 2012.