Lab.gruppen AB

Direct Lake™ Messaging v3.4

3rd party protocol for Lake™ enabled products

The Direct Lake Messaging provides an Ethernet 3rd party protocol suitable for integration with third party control and monitoring applications such as AMX®,Crestron® or other custom control software.

This document provides all of the reference information required to implement a control interface for an end user's custom application.

Lab.gruppen AB
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1 Release notes

1.1 Known Issues

If the wrong syntax is used and command gets an arbitrary input instead of the expected "1" or "0", that syntax may be interpreted as a "0".

1.2 Disclaimer

Via the DLM it is possible to set illegal parameters for many settings. It is advisable to implement user limitations in a 3rd party UI. Examples of possible illegal settings are:

- Set the input routing priority list such as that the analog input is higher prioritized than for example AES or Dante inputs.
- Set gain, delay etc. parameters outside the normal borders.

2 Version requirements

This document applies to:

PLM Series products firmware versions:

DLM protocol version 1:	2.58 and above, or until further notice.
DLM protocol version 1 and 2:	2.74 and above, or until further notice (i.e. firmware 2.74 and above are fully backwards compatible with DLM protocol version 1). All mains input monitoring is PLM 20000Q unique features.

LM Series products firmware versions:

DLM protocol version 2:	0.32 and above, or until further notice.

D Series & PLM+ products firmware versions:

DLM protocol version 3:	2.36 and above, or until further notice.

dlmTest application **Version 1.0.0.11** is the dlmTest application that this document applies to.

Some commands may require a later firmware version than stated here.
Please check the exact requirement in the heading of each command.

3 Important: Networks and multiple adapters

The DLM protocol uses Ethernet and UDP/IP protocols for communication with Lake enabled products. Having more than one network adapter active on the control device may cause problems.

3.1 Description and root cause

The code will bind a UDP socket to a specific adapter's IP-address to guarantee that the packets originate from that interface. Still, routing may decide to route the packets through another interface based on destination address and costs associated with each interface. You may look at the active routing table by typing 'route print' at the command prompt.

3.2 Workarounds

3.2.1 Limit the number of network adapters

If possible, use only one network adapter. This will eliminate all problematic routing scenarios.

3.2.2 Edit routing table (advanced)

Use the 'route' command at the command prompt to correct the routing.

4 Usage of UDP Ports

4.1 Fixed response port

The following ports shall be used by the application for communication in fixed port mode:

UDP Port	Purpose
6015	Device destination port when transmitting packets (i.e. listening port on the device)
6004	Application listening port for receiving packets (i.e. listening port on the computer)

Port 6004 may not be used by any other program.

4.2 Dynamic response port

The following port shall be used by the application for communication in dynamic port mode:

UDP Port	Purpose
6016	Device destination port when transmitting packets (i.e. listening port on the device).
[TP]	Reply is sent to the port from which the message originated on the computer.

5 DLM Packet format

The DLM protocol is based on the UDP protocol where the payload of the UDP packet contains the actual DLM message. Every message needs to be formatted in following way:

A header, a variable length payload and footer:

Header	Payload	Footer

5.1 Message Header

The following table depicts the structure of the packet header:

Field	Name	Size	Comment
lSrcIDHi	Source ID	4 Bytes	Hi and Lo 32 bits of the Src unique 64 bit ID
LSrcIDLo	Source ID	4 Bytes	
lDestIDHi	Destination ID	4 Bytes	Hi and Lo 32 bits of the Dest unique 64 bit ID
lDestIDLo	Destination ID	4 Bytes	
sSrcClass	Source Class	2 Bytes	Host class for this application
sDestClass	Destination Class	2 Bytes	Module class for this application
sLength	Length	2 Bytes	Total length of packet including header and footer in bytes. Maximum length is 560 bytes.
sPacketType	Packet Type	2 Bytes	**(see 5.1.6 below)**
lMsgID	Message ID	4 Bytes	A unique number for every packet. If the sender of the packet does not require a response, set this to 0xFFFFFFFF (-1)

5.1.1 Source ID

The Source ID identifies the sending (source) application and can be any value. The device verifies that the Message ID is incremented for each packet from the same source.

5.1.2 Destination ID

In order to send a message to a specific device on the network, each device's unique hardware ID must be determined. See "Addressing a Device" in section 7.

If a specific unit is to be addressed the units hardware ID is used as destination ID in packet header.

If all units are to be addressed the destination ID in packet header is set to broadcast ID according to constants below:

```
const int C_BROADCAST_IDHI = -2;
const int C_BROADCAST_IDLO = -3;
```

5.1.3 Source Class

The source class should be set to 6 indicating a host.

```
const int C_HOST_CLASS_ID = 6;
```

5.1.4 Destination Class

If communicating with a specific device the destination class should be set to 5.

```
const int C_PLM_MODULE_CLASS_ID = 5;
```

Alternatively, if the application does not require addressing each hardware processor individually, the application can use the BROADCAST preprocessor macros for class and device IDs.

```
const int C_BROADCAST_CLASS_ID = 0;
```

5.1.5 Packet Length

The maximum length of a packet is 560 bytes, including the header and footer. The hardware will not accept larger packets. The sender must split data into smaller packets if the payload makes the packet larger than the maximum length.

5.1.6 Packet type

The packet type is a number which is unique for every type of packet that can be sent between devices. The two types available are "DLM message" for sending a message to the device and "Acknowledge" which indicates a reply to the previous DLM message (see 6).

```
const int C_ACK_MSG = 2;
        // Ack message
const int C_DLM_MSG = 701;    // DLM message
```

5.1.7 Message ID

The message ID should be unique for every packet sent from a device that is expecting a response. When the receiving device sends a response back to the sender it puts the sender's Message ID into the header of the packet of its reply, this allows the sender to match the response with the request that it made.

If the sending device sets the Message ID to 0xFFFFFFFF (-1), the receiver will not send a response.

5.2 Packet Payload

The payload contains the message, and is between 0-532 bytes.

For a full example, including Packet Header, Packet Payload and Packet Footer – please consult the example in 12 Appendix D: Example application HEX string.

5.3 Packet Footer

The footer contains a reserved 4 byte (32 bit) value.

5.4 Byte Ordering

The values in the packet data structures are in 'little endian' format, however the data is sent between the Master and DLM a single byte at a time, starting with the first byte of the packet.

See example.

6 Messages

6.1 Msg_DLMMsg

Packet Name	Packet Type	Response	Comment
Msg_DLMMsg	701	Msg_DLMMsg or Msg_Ack	High Level command interface
Field	**Name**	**Size**	**Comment**
szMsg	Command text	Variable	Null terminated text string containing command

Msg_DLMMsg allows you to send high level commands as a text string. The command is parsed by the receiver. Data is either returned in an Msg_DLMMsg packet or an Msg_Ack that returns an error code or ACK_SUCCESS.

6.2 Msg_Ack

Packet Name	Packet Type	Response	Comment
Msg_Ack	2	N/A	Acknowledge sent from device in response to some packets
Field	**Name**	**Size**	**Comment**
lResult	Result	4 Bytes	A 32 bit return value (see table below)

The following table lists result codes for the Msg_Ack packet:

Ack Result	Value	Comment
ACK_SUCCESS	-2	Packet processed successfully
ACK_NOTMASTER	-3	Sender not master of the device
ACK_INVALID_PACKET	-4	Indicates a packet with bad checksum, or unsupported type
ACK_DSP_ERROR	-5	Communication with the DSP failed
ACK_BAD_PARAM	-6	Bad parameters in packet

To receive the responses to the Msg_DLMMsg packets, the listening application must receive packets on UDP port 6004.

6.3 Broadcast messages

PLM frames with firmware 2.58 are constantly broadcasting messages (e.g. packet type 4, 116, 165 etc) which is part of the proprietary control protocol and therefore not explained here. As of PLM firmware 2.74 and LM firmware 0.32 broadcast is no longer utilized and has been replaced by a unicast scheme.

7 Addressing a device

One can either address a specific device or all units at the same time.

7.1 Address a specific unit

There are two different ways of addressing a specific unit.

- Send a unicast UDP with the specific device's hardware ID as Destination ID. This is the recommended addressing scheme.
  Please note that the default IP setting is Auto ZeroConf which means that a specific device might get different IP addresses every boot up.
- Send a broadcast UDP packet to the device with the specific device's hardware ID as Destination ID.

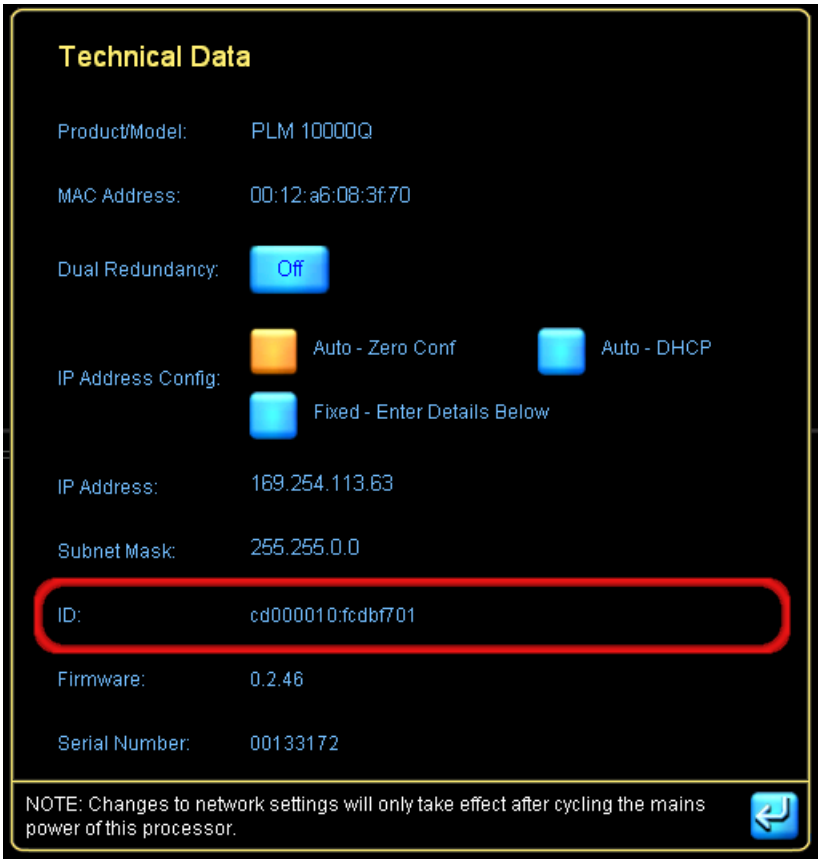
7.2 Address all units

If the application does not require addressing each hardware processor individually, the application can broadcast a UPD packet to all processors and set the Destination Class ID to broadcast.

7.3 Determining a unit's hardware ID

In order to send Ethernet packets to specific hardware processors on the network, each processor's unique hardware ID must be determined. These IDs are utilized as Destination ID within the packet header, as described in section 5.1.

The hardware ID is presented by the Lake Controller software within the I/O Config user interface display. From the Home page, navigate to Modules, select a module on the desired hardware processor and tap on the I/O Config button. Then click on the button entitled "Technical Data" to bring up the pop-up window as shown in the figure. The unique ID is highlighted below.



The hardware ID (Frame ID) can also be found on the front panel by selecting MENU->Frame->Network.

8 Appendix A: Command reference

This section describes all commands in the 3rd party control protocol.

8.1 Nomenclature

These are the set of commands that will be supported to be sent as the szMsg in the Msg_DLMMsg. Each level in the command tree is separated with a '.' and all commands can be operated using one or many of the operation types:

- '!' is Do something
- '=' is Set/Store something
- '?' is Get something

Some commands have one or multiple parameters. In the commands below parameters are described within <> brackets. Each parameter is delimited with a single white space ' '. Formats and range of each parameter is described in the comments field.

8.1.1 Enumeration parameters

Different models have different number of modules; we have defined an enumeration type that is used in command tables below to indicate correct number of modules depending on model.

Frame model	MODULE_ENUM
Legacy PLM	A-B
LM in contour mode	A-B
D Series & PLM+	A-D

8.1.2 Amp channel notation

For D Series & PLM+ a new notation is added, instead of asking for a module/dsp combination one could ask for the value corresponding to a routed power channel e.g. if power channel 2 is routed to module A DSP channel 1 then "Mod.Out.Label?A 1" could be replaced by "Mod.Out.Label?#2". Note that there is no space between # and 2.

This way a user of 3PP doesn't need to know the routing for a specific power channel, it could ask directly for the module parameter related to the power channel.

This notation works for all Mod.In and Mod.Out parameters.

Examples:
"Mod.In.Gain?#3"
"Mod.Mod.Label?#4"

8.2 Quick reference

Command syntax	GET	SET	DO	Support	Description
Dev.ModelName	X			D Series & PLM+ 2.36	Frame's (product) model name
Dev.ModelName	X			D Series & PLM+ 2.36	Frame's (product) model name
Dev.IsoFloat	X	X		D Series & PLM+ 2.36 PLM 2.58	Control ISO float settings
Dev.IsoFloatInputs	X	X		LM 0.32	Inputs floating or grounded
Dev.IsoFloatOutputs	X	X		LM 0.32	Outputs floating or grounded
Dev.AesLoopTermination	X	X		PLM+ 2.36, PLM 2.58, LM 0.32	Unterminated or terminated
Dev.Power	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Gets and sets desired power state
Dev.BundleVer	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Version of the software bundle (.lkc file) being used.
Dev.Preset.Name	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Names of stored frame presets
Dev.Preset.Recall			X	D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Recall a certain frame Preset
Dev.Preset.Store			X	D Series & PLM+ 2.36, PLM 2.74, LM 0.32	Store a frame Preset
Dev.Network.ID	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Get Frame Hardware ID
Dev.Network.IPAddr	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Gets frame's IP address
Dev.Network.SubMask	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Get the frames subnet mask
Dev.Network.MACAddr	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Get the frames MAC Address
Dev.NetworkIPConf	X			D Series & PLM+ 2.36, PLM 4.33, LM 2.30	Get the frames current IP Configuration

Dev.Network.Redund	X	X		D Series & PLM+ 2.36, PLM 4.33, LM 2.30	Get the frames current Dual Redundancy configuration
Dev.Reset.Factory			X	D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Do full factory reset
Dev.Reset.Soft			X	D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Do soft reset. (Reset processing to default).
Dev.Reset.Contour			X	LM 1.00	Reset processing to Contour
Dev.Reset.Mesa			X	LM 1.00	Reset processing to Mesa
Dev.Fuse.NominalCurrent	X	X		D Series & PLM+ 2.36, PLM 2.74	Breaker emulation current. Only valid for PLM 20000Q & D Series & PLM+.
Dev.Fuse.Type	X	X		D Series & PLM+ 2.36, PLM 2.74	Breaker emulation type. Only valid for PLM 20000Q & D Series & PLM+.
Dev.Route	X			D Series & PLM+ 2.36, PLM 2.58	Get how amp channels are routed from the Band DSP outputs
Dev.BridgeMode	X			D Series & PLM+ 2.36, PLM 2.74	Channel pair bridge mode.
Dev.Out.Route	X	X		LM 0.32	Get and set how channels are routed.
Dev.FrameLabel	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Get and set frame label.
Dev.Latency	X			D Series & PLM+ 2.36, PLM 2.58	Get total latency for a power channel (Amp latency + Lake latency)
Dev.LatencyMatch	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Activate or deactive latency match mode.
Dev.Speakers	X	X		D Series & PLM+ 2.36, PLM 2.58	Configure number of speakers for a power channel
Dev.Load.Speakers	X	X		D Series & PLM+ 2.36, PLM 2.94	Configure number of speakers for a power channel
Dev.Load.MaskNotVerified	X	X		PLM 2.94	Configure for mask load not verified warning.
Dev.Pwr.Attenuation	X	X		D Series & PLM+ 2.36, PLM 2.98	Used to change the Power Channel Attenuation.
Dev.Pwr.Mute	X	X		D Series & PLM+ 2.36, PLM 2.98	Set or get Power Channel Mute.
Dev.GPI.Config	X	X		LM 0.32	Get or set GPI configuration

Dev.GPI.State	X			LM 0.32	Get current GPI state
Dev.GPO.Config	X	X		LM 0.32	Get or set GPO configuration.
Dev.GPO.State	X			LM 0.32	Get current GPO state
Dev.Dante.BreakIn	X	X		D Series & PLM+ 2.36, PLM 2.79	Transmitt inputs or probes (voltage/current) out on a Dante channel.
Dev.Dante.Enabled	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Is Dante Enabled
Dev.Dante.In.Label	X			LM 0.32	Dante input channels labels
Dev.Dante.SlaveOnly	X			D Series & PLM+ 2.36, PLM 4.33, LM 2.30	Is Dante SlaveOnly Enabled
Dev.Router.InputTypSel	X	X		PLM 2.58	Configure inputs (prio, type, channel, sensitivity) PLM 2.80 for optional Sensitivity
Dev.Router.InputTypSel	X	X		D Series & PLM+ 2.36	Configure inputs (prio, type, channel, sensitivity)
Dev.Router.InputTypSel	X	X		LM 0.32	Configure inputs (prio, type, channel, sensitivity) LM 0.35 for optional Sensitivity.
Dev.Router.InputAct	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	
Dev.Router.ForceInputPriority	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Select if auto selecting according to input priority settings should be used or if an input priority level should be forced
Dev.Route.InputSR	X			D Series & PLM+ 2.36, PLM 2.58	Input sample rate
Dev.Route.InputSR	X			LM 0.32	Input sample rate
Dev.Router.InputMute	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Mute / unmute inputs
Dev.MD.NoFaults	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Checks if there is any faults present in the device
Dev.MD.FullBin	X			D Series & PLM+ 2.36, PLM 2.58 & 2.74	Retrieves a full meter data structure as binary data.
Dev.MD.FullBin	X			LM 0.32	Retrieves a full meter data structure as binary data
Dev.PTG.Active	X	X		PLM 2.58	Activates / deactivates pilot tone generation for power channel. Only PLM 10000Q and 14000

Dev.PTG.Impedance	X			PLM 2.58	Impedance measurement. Only PLM 10000Q and 14000
Dev.PTG.Active	X	X		PLM 2.99	Activates / deactivates pilot tone generation for power channel. Only PLM 20000Q
Dev.PTG.Impedance	X			PLM 2.58	Impedance measurement. Only PLM 20000Q
Dev.LoadPilot.Enable	X	X		D Series & PLM+ 2.36	Activates / deactivates pilot tone generation for power channel
Dev.LoadPilot.Readings	X			D Series & PLM+ 2.36	Readings for power channel
Dev.LoadPilot.Signal				D Series & PLM+ 2.36	Signal setting
Dev.LoadPilot.Threshold	X	X		D Series & PLM+ 2.36	Gets or sets the impedance thresholds.
Mod.Out.Mute	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Mute module output channel
Mod.Out.Gain	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Control module output gain
Mod.Out.Delay	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Control module output delay
Mod.Out.MaxRMSLvl	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max RMS Level
Mod.Out.MaxRMSCor	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max RMS Corner
Mod.Out.MaxRMSAtk	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max RMS Attack
Mod.Out.MaxRMSRel				D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max RMS Release
Mod.Out.MaxPeakLvl	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max Peak level
Mod.Out.Phase	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Output polarity
Mod.Out.Label	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Module output label

Mod.Out.AmpGain				D Series & PLM+ 2.36, PLM 2.58	Module output amplifier gain
Mod.Out.AmpVPL				D Series & PLM+ 2.36, PLM 2.58	Voltage peak limit
Mod.Out.VPLProfile				D Series & PLM+ 2.36, PLM 2.58	Voltage peak limit profile
Mod.Out.Chans				D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Returns the number of output channels for a module
Mod.In.MixerGain	X	X		D Series & PLM+ 2.36, LM 0.32	Module input mixer gain
Mod.In.Mute	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Mute module input channel
Mod.In.Gain	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Control module input gain
Mod.In.Delay	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Control module input delay
Mod.In.Phase	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Input polarity
Mod.In.Label	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Module input label
Mod.Mod.Label	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Module label
Mod.Mod.Selected	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Use to indicate to PC and on front that module is selected.

8.3 Device Commands

Command syntax	GET	SET	DO	Support	Description
Dev.ModelName	X			D Series & PLM+ 2.36	Frame's (product) model name
Type	**Parameters**			**Range/resolution**	
?					

Reply:	<Model name>	szString
Example		
Reply for PLM: 12K44 and 20K44. Reply for D-series: D80:4L, D120:4L and D200:4L.		

Command syntax	GET	SET	DO	Support	Description
Dev.IsoFloat	X	X		D Series & PLM+ 2.36 PLM 2.58	Control ISO float settings

Operation	Parameters	Range / Resolution
?		
Reply:	<Off/On>	0=Floating, 1=Grounded
Operation	Parameters	Range / Resolution
=	<Off/On>	0=Floating, 1=Grounded
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.IsoFloatInputs	X	X		LM 0.32	Inputs floating or grounded

Operation	Parameters	Range / Resolution
?		
Reply:	<Off/On>	0=Floating, 1=Grounded
Operation	Parameters	Range / Resolution
=	<Off/On>	0=Floating, 1=Grounded
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.IsoFloatOutputs	X	X		LM 0.32	Outputs floating or grounded

Operation	Parameters	Range / Resolution
?		
Reply:	<Off/On>	0=Floating, 1=Grounded
Operation	Parameters	Range / Resolution
=	<Off/On>	0=Floating, 1=Grounded
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.AesLoopTermination	X	X		PLM+ 2.36, PLM 2.58, LM 0.32	Unterminated or terminated

Operation	Parameters	Range / Resolution
?		
Reply:	<Unconnected/Connected>	0=Unterminated, 1=Terminated
Operation	Parameters	Range / Resolution
=	<Unconnected/Connected>	0=Unterminated, 1=Terminated

Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Power	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Gets and sets desired power state

Operation	Parameters	Range / Resolution
?		
Reply:	<On/Standby>	1 = 0n, 0 = Standby

Operation	Parameters	Range / Resolution
=	<On/Standby>	1 = 0n, 0 = Standby
Reply:	Ack	

Notes / Verbose description

There are two additional acknowledge response codes that can occur with this command:

```
#define ACK_SPI_PWRON       -20L  /* Command not sent because the frame is already on */
#define ACK_SPI_PWROFF      -21L  /* Command not sent because the frame is already off */
```

8.3.1 Firmware

Command syntax	GET	SET	DO	Support	Description
Dev.BundleVer	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Version of the software bundle (.lkc file) being used.

Operation	Parameters	Range / Resolution
?		
Reply:	<.lkc file Bundle Version>	szString

8.3.2 Preset

Command syntax	GET	SET	DO	Support	Description
Dev.Preset.Name	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Names of stored frame presets

Operation	Parameters	Range / Resolution
?	<Preset #>	1-100
Reply:	<Preset Name>	szString[64]

Command syntax	GET	SET	DO	Support	Description
Dev.Preset.Recall			X	D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Recall a certain frame Preset

Operation	Parameters	Range / Resolution
!	<Preset #>	1-100
Reply:	Ack	

Example

"Dev.Preset.Recall!1" - Recall preset 1.
Notes / Verbose description
Recall a certain frame Preset (delayed response)

Command syntax	GET	SET	DO	Support	Description
Dev.Preset.Store			X	D Series & PLM+ 2.36, PLM 2.74, LM 0.32	Store a frame Preset

Operation	Parameters	Range / Resolution
!	<Preset #>	1-100
	<Preset Name>	szString[64]
Reply:	Ack	
Example		
"Dev.Preset.Store!1 testpreset" - Stores a preset with the current configuration called testpreset on preset position 1		

8.3.3 Network settings

Command syntax	GET	SET	DO	Support	Description
Dev.Network.ID	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Get Frame Hardware ID

Frame ID ()		
Description		
Operation	Parameters	Range / Resolution
?		
Reply:	<DLM Frame ID>	szString xxxxxxxx:xxxxxxxx

Command syntax	GET	SET	DO	Support	Description
Dev.Network.IPAddr	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Gets frame's IP address

Operation	Parameters	Range / Resolution
?		
Reply:	<IP address>	szString xxx.xxx.xxx.xxx

Command syntax	GET	SET	DO	Support	Description
Dev.Network.SubMask	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Get the frames subnet mask

Operation	Parameters	Range / Resolution

?		
Reply:	<Subnet Mask>	szString xxx.xxx.xxx.xxx

Command syntax	GET	SET	DO	Support	Description
Dev.Network.MACAddr	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Get the frames MAC Address

Operation	Parameters	Range / Resolution
?		
Reply:	<MAC Address>	szString xx:xx:xx:xx:xx:xx

Command syntax	GET	SET	DO	Support	Description
Dev.NetworkIPConf	X			D Series & PLM+ 2.36, PLM 4.33, LM 2.30	Get the frames current IP Configuration

Operation	Parameters	Range / Resolution
?		
Reply:	<IP Config>	0=Zero Conf, 1=DHCP, 2=Static

Command syntax	GET	SET	DO	Support	Description
Dev.Network.Redund	X	X		D Series & PLM+ 2.36, PLM 4.33, LM 2.30	Get the frames current Dual Redundancy configuration

Operation	Parameters	Range / Resolution
?		
Reply:	<Redundancy>	0=Disabled, 1=Enabled
Type	Parameters	Range/resolution
=	< Redundancy >	0=Disabled, 1=Enabled
Reply:	Ack	

8.3.4 Reset

Command syntax	GET	SET	DO	Support	Description
Dev.Reset.Factory			X	D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Do full factory reset

Operation	Parameters	Range / Resolution
!		
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description

Dev.Reset.Soft			X	D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Do soft reset. (Reset processing to default).

Operation	Parameters	Range / Resolution
!		
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Reset.Contour			X	LM 1.00	Reset processing to Contour

Operation	Parameters	Range / Resolution
!		
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Reset.Mesa			X	LM 1.00	Reset processing to Mesa

Operation	Parameters	Range / Resolution
!		
Reply:	Ack	

8.3.5 Breaker Emulation (Fuse)

Command syntax	GET	SET	DO	Support	Description
Dev.Fuse.NominalCurrent	X	X		D Series & PLM+ 2.36, PLM 2.74	Breaker emulation current. Only valid for PLM 20000Q & D Series & PLM+.

Type	Parameters	Range/resolution
?		
Reply:	<Nominal Current in A> <Actual Current in A>	szString (x)x.x (range 5-32.0) szString (x)x.x (range 5-32.0)

Type	Parameters	Range/resolution
=	<Nominal Current>	szString (x)x.x (range 5-32.0)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Fuse.Type	X	X		D Series & PLM+ 2.36, PLM 2.74	Breaker emulation type. Only valid for PLM 20000Q & D Series & PLM+.

Type	Parameters	Range/resolution
?		
Reply:	<Type>	0=Conservative, 1=Fast, 2=Universal

Type	Parameters	Range/resolution
=	<Type>	0=Conservative, 1=Fast, 2=Universal
Reply:	Ack	

8.3.6 Miscellaneous

Command syntax	GET	SET	DO	Support	Description
Dev.Route	X			D Series & PLM+ 2.36, PLM 2.58	Get how amp channels are routed from the Band DSP outputs

Type	Parameters	Range/resolution
?	<Module> <Proc Channel>	MODULE_ENUM 1-6
Reply:	<Power Outputs>	CsCsCsC (where C is X for position routed and – for not routed and s are space char)

Command syntax	GET	SET	DO	Support	Description
Dev.BridgeMode	X			D Series & PLM+ 2.36, PLM 2.74	Channel pair bridge mode.

Type	Parameters	Range/resolution
?	<Channel Pair>	1-2
Reply:	<Bridge Mode>	0=Off, 1=On

Command syntax	GET	SET	DO	Support	Description
Dev.Out.Route	X	X		LM 0.32	Get and set how channels are routed.

Type	Parameters	Range/resolution
?	<Source Type> <Channel Number> <Output Type>	PC, Analog, AES, Dante, Router (PC is Processing Channel) 1-x (x=6 for PC, 2 for Analog, 4 for AES and Dante, 6 for Router) Analog, AES, Dante
Reply:	<Routed Outputs>	CC..CC (where C is X for position routed and – for not routed) 6 C positions for Analog outputs and 8 C positions for AES and Dante outputs.
Type	Parameters	Range/resolution
=	<Source Type> <Channel Number> <Output Type> <Routed Outputs>	PC, Analog, AES, Dante, Router (PC is Processing Channel) 1-x (x=6 for PC, 2 for Analog, 4 for AES and Dante, 6 for Router) Analog, AES, Dante CC..CC (where C is X for position routed and – for not routed) 6 C positions for Analog outputs and 8 C positions for AES and Dante outputs.
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description

Dev.FrameLabel	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Get and set frame label.

Type	Parameters	Range/resolution
?		
Reply:	<Frame Label>	szString[30]
Type	Parameters	Range/resolution
=	<Frame Label>	szString[30]
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Latency	X			D Series & PLM+ 2.36, PLM 2.58	Get total latency for a power channel (Amp latency + Lake latency)

Type	Parameters	Range/resolution
?	<Power Channel>	1-4
Reply:	<Inherent latency in ms>	szString (xxx)x.xxxx (range 0.000-1000.000)

Command syntax	GET	SET	DO	Support	Description
Dev.LatencyMatch	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Activate or deactive latency match mode.

Type	Parameters	Range/resolution
?		
Reply:	<Match>	0=Off, 1=On
Type	Parameters	Range/resolution
=	<Match>	0=Off, 1=On
Reply:	Ack	

8.3.7 Load

Command syntax	GET	SET	DO	Support	Description
Dev.Speakers	X	X		D Series & PLM+ 2.36, PLM 2.58	Configure number of speakers for a power channel

Type	Parameters	Range/resolution
?	<Power Channel>	1-4
Reply:	<Number of Speakers>	
Type	Parameters	Range/resolution
=	<Power Channel> <Number of Speakers>	1-4
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Load.Speakers	X	X		D Series & PLM+ 2.36, PLM 2.94	Configure number of speakers for a power channel

Type	Parameters	Range/resolution
?	<Power Channel>	1-4
Reply:	<Number of Speakers>	
Type	Parameters	Range/resolution
=	<Power Channel> <Number of Speakers>	1-4
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Load.MaskNotVerified	X	X		PLM 2.94	Configure for mask load not verified warning.

Type	Parameters	Range/resolution
?		0=No mask, 1=Mask
Reply:	<No mask/mask>	
Type	Parameters	Range/resolution
=	<No mask/mask>	0=No mask, 1=Mask
Reply:	Ack	

Notes / Verbose description
Choose to mask (disable) or not (enable) warning that "load is not verified". Default value of this parameter is 0. This setting is not part of System files, Frame presets or similar and is not affected by Factory- or Soft Reset and persists thrugh Standby- and Power cycle. This command is obsolete for releases LC 6.3 and higher as the warning was removed for all product platforms.

8.3.8 Power Channel

Command syntax	GET	SET	DO	Support	Description
Dev.Pwr.Attenuation	X	X		D Series & PLM+ 2.36, PLM 2.98	Used to change the Power Channel Attenuation.

Type	Parameters	Range/resolution
?	<Power Channel>	1-4
Reply:	<Attenuation in -dB>	szString (xxx)x.xx (range -100.00 - 0.00)
Type	Parameters	Range/resolution
=	<Power Channel> <Attenuation in -dB>	1-4 szString (xxx)x.xx (range -100.00 - 0.00) in 0.25 dB increments.
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Pwr.Mute	X	X		D Series & PLM+ 2.36, PLM 2.98	Set or get Power Channel Mute.

Type	Parameters	Range/resolution
?	<Power Channel>	1-4
Reply:	<Mute>	1=Muted, 0=Unmuted
Type	Parameters	Range/resolution
=	<Power Channel> <Mute>	1-4 1=Muted, 0=Unmuted
Reply:	Ack	

8.3.9 GPIO

Command syntax	GET	SET	DO	Support	Description
Dev.GPI.Config	X	X		LM 0.32	Get or set GPI configuration
Type	Parameters			Range/resolution	
?	<Input>			1-2	
Reply:	<Action when Closed> <Action when Opened>			Actions for ProtectiveMuteState: ToggleMute, Mute, Unmute, NoAction Actions for StandbyState: ToggleStandby, Standby, On, NoAction Actions for PresetRecall: Recall99, Recall100, NoAction Action for NoAction: NoAction	
Type	Parameters			Range/resolution	
=	<Input> <Action when Closed> <Action when Opened>			1-2 Actions for ProtectiveMuteState: ToggleMute, Mute, Unmute, NoAction Actions for StandbyState: ToggleStandby, Standby, On, NoAction Actions for PresetRecall: Recall99, Recall100, NoAction Action for NoAction: NoAction Note that both closed and opened action must be of the same type, i.e. ProtectiveMuteState, StandbyState or PresetRecall.	
Reply:	Ack				

Command syntax	GET	SET	DO	Support	Description
Dev.GPI.State	X			LM 0.32	Get current GPI state
Type	Parameters			Range/resolution	
?	<Input>			1-2	
Reply:	<Current State>			Open, Closed	

Command syntax	GET	SET	DO	Support	Description
Dev.GPO.Config	X	X		LM 0.32	Get or set GPO configuration.
Type	Parameters			Range/resolution	
?	<Output>			1-2	

Reply:	<Indication when Closed>	Indications for ProtectiveMuteState: Muted, Unmuted Indications for StandbyState: Standby, On Indications for Fault: NoFault, Fault Indications for Ready: NotReady, Ready Indications for NoIndication: NoInd
Type	Parameters	Range/resolution
=	<Output> <Indication when Closed>	1-2 Indications for ProtectiveMuteState: Muted, Unmuted Indications for StandbyState: Standby, On Indications for Fault: NoFault, Fault Indications for Ready: NotReady, Ready Indications for NoIndication: NoInd
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.GPO.State	X			LM 0.32	Get current GPO state

Type	Parameters	Range/resolution
?	<Output>	1-2
Reply:	<Current State>	Open, Closed

8.3.10 Dante

Command syntax	GET	SET	DO	Support	Description
Dev.Dante.BreakIn	X	X		D Series & PLM+ 2.36, PLM 2.79	Transmitt inputs or probes (voltage/current) out on a Dante channel.

Type	Parameters	Range/resolution
?	<Dante transmitter>	1-2
Reply:	<Type> <Ch> <Probe type> <Power channel>	Analog, AES, Probe, Empty 1-2 U, I (Voltage or current probe, only returned when Type is Probe) 1-4 (only returned when Type is Probe)
Type	Parameters	Range/resolution
=	<Dante transmitter> <Type> <Ch> <Probe type> <Power channel>	1-2 Analog, AES, Probe, Empty 1-2 U, I (Voltage or current probe, only valid when Type is Probe) 1-4 (only valid when Type is Probe)
Reply:	Ack	
Notes / Verbose description		

Command syntax	GET	SET	DO	Support	Description
Dev.Dante.Enabled	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Is Dante Enabled

Type	Parameters	Range/resolution
?		
Reply:	<Enabled>	0=Off, 1=On

Command syntax	GET	SET	DO	Support	Description
Dev.Dante.In.Label	X			LM 0.32	Dante input channels labels

Type	Parameters	Range/resolution
?	<Dante input>	1-4
Reply:	<Label>	szString[32], Empty string if channel is unused

Command syntax	GET	SET	DO	Support	Description
Dev.Dante.SlaveOnly	X			D Series & PLM+ 2.36, PLM 4.33, LM 2.30	Is Dante SlaveOnly Enabled

Type	Parameters	Range/resolution
?		
Reply:	<Enabled>	0=Off, 1=On

8.3.11 Input Type Selection

Command syntax	GET	SET	DO	Support	Description
Dev.Router.InputTypSel	X	X		PLM 2.58	Configure inputs (prio, type, channel, sensitivity) PLM 2.80 for optional Sensitivity

Type	Parameters	Range/resolution
?	<Input> <Prio>	1-2 1-4
Reply:	<Type> <Ch> <Sensitivity> <Name>	Analog, AES, Dante, Empty 1-2 12.00 or 26.00 for Analog, -(xx)x.xx (range -100.00 - 15.00) for AES and Dante Dante channel name (optional)

Type	Parameters	Range/resolution
=	<Input> <Prio> <Type> <Ch> <Sensitivity>	1-2 1-4 Analog, AES, Dante, Empty 1-2 12.00 or 26.00 for Analog, -(xx)x.xx (range -100.00 - 15.00) for AES and Dante ((Sensitivity is an optional parameter, when not submitted

		default values will be applied. 26 dBu for Analog and 0 dB for AES))
Reply:	Ack	
Notes / Verbose description		
Note: The Sensitivity is in dBu for Analog and dB for AES.If an Analog input is selected at priority x then all priorities x+n for the same input must be Empty.		

Command syntax	GET	SET	DO	Support	Description
Dev.Router.InputTypSel	X	X		D Series & PLM+ 2.36	Configure inputs (prio, type, channel, sensitivity)
Type	**Parameters**			**Range/resolution**	
?	<Input>			1-4	
	<Prio>			1-4	
Reply:	<Type>			Analog, AES, Dante, Empty	
	<Ch>			1-2 for Analog, 1-4 for AES, 1-8 for Dante	
	<Sensitivity>			26.00 for Analog, -(xx)x.xx (range -100.00 - 15.00) for AES and Dante	
	<Name>			Dante channel name (optional)	
Type	**Parameters**			**Range/resolution**	
=	<Input>			1-4	
	<Prio>			1-4	
	<Type>			Analog, AES, Dante, Empty	
	<Ch>			1-2 for Analog, 1-4 for AES, 1-8 for Dante	
	<Sensitivity>			26.00 for Analog, -(xx)x.xx (range -100.00 - 15.00) for AES and Dante ((Sensitivity is an optional parameter, when not submitted default values will be applied. 26 dBu for Analog and 0 dB for AES))	
Reply:	Ack				
Notes / Verbose description					
Note: The Sensitivity is in dBu for Analog and dB for AES.If an Analog input is selected at priority x then all priorities x+n for the same input must be Empty.					

Command syntax	GET	SET	DO	Support	Description
Dev.Router.InputTypSel	X	X		LM 0.32	Configure inputs (prio, type, channel, sensitivity) LM 0.35 for optional Sensitivity.
Type	**Parameters**			**Range/resolution**	
?	<Input>			1-6 (1-8 from 0.56)	
	<Prio>			1-4	
Reply:	<Type>			Analog, AES, Dante, Empty	
	<Ch>			1-x (x=2 for analog, 4 for AES and Dante)	
	<Sensitivity>			12.00 or 26.00 for Analog, -(xx)x.xx (range -100.00 - 15.00) for AES and Dante	
Type	**Parameters**			**Range/resolution**	
=	<Input>			1-6 (1-8 from 0.56)	

	<Prio> <Type> <Ch> <Sensitivity>	1-4 Analog, AES, Dante, Empty 1-x (x=2 for analog, 4 for AES and Dante) 12.00 or 26.00 for Analog, -(xx)x.xx (range -100.00 - 15.00) for AES and Dante ((Sensitivity is an optional parameter, when not submitted default values will be applied. 26 dBu for Analog and 0 dB for AES))
Reply:	Ack	

Notes / Verbose description
Note: The Sensitivity is in dBu for Analog and dB for AES.If an Analog input is selected at priority x then all priorities x+n for the same input must be Empty.

Command syntax	GET	SET	DO	Support	Description
Dev.Router.InputAct	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	

Type	Parameters	Range/resolution
?	<Input>	1-x (2 for PLM, 4 for D Series & PLM+, 6 for LM)
Reply:	<Priority>	1-4

Command syntax	GET	SET	DO	Support	Description
Dev.Router.ForceInputPriority	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Select if auto selecting according to input priority settings should be used or if an input priority level should be forced

Type	Parameters	Range/resolution
?	<Input>	1-x (2 for PLM, 4 for D Series & PLM+, 6 for LM)
Reply:	<Auto/Force>	0=Auto, 1-4=Force priority 1-4
Type	Parameters	Range/resolution
=	<Input> <Auto/Force>	1-x (2 for PLM, 4 for D Series & PLM+, 6 for LM) 0=Auto, 1-4=Force priority 1-4
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Dev.Route.InputSR	X			D Series & PLM+ 2.36, PLM 2.58	Input sample rate

Type	Parameters	Range/resolution
?	<Type>	AES

	<Ch>	1-x (2 for PLM, 4 for D Series & PLM+)
Reply:	<Sample rate in kHz>	00.0 for no input otherwise sample rate E.g. 44.1/48.0/88.2/96.0/176.4/192.0
Notes / Verbose description		

Command syntax	GET	SET	DO	Support	Description
Dev.Route.InputSR	X			LM 0.32	Input sample rate

Type	Parameters	Range/resolution
?	<Type> <Ch>	AES, Dante 1-4 (1-8 for AES for LM 44)
Reply:	<Sample rate in kHz>	00.0 for no input otherwise sample rate E.g. 44.1/48.0/88.2/96.0/176.4/192.0

Command syntax	GET	SET	DO	Support	Description
Dev.Router.InputMute	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Mute / unmute inputs

Type	Parameters	Range/resolution
?	<Input>	1-x (2 for PLM, 4 for D Series & PLM+, 6 for LM)
Reply:	<Mute>	1=Muted, 0=Unmuted
Type	Parameters	Range/resolution
=	<Input> <Mute>	1-x (2 for PLM, 4 for D Series & PLM+, 6 for LM) 1=Muted, 0=Unmute
Reply:	Ack	

8.3.12 Meter Data (Dev.MD)

Command syntax	GET	SET	DO	Support	Description
Dev.MD.NoFaults	X			D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Checks if there is any faults present in the device

Operation	Parameters	Range / Resolution
?		
Reply:	<Any faults present>	0 = Faults present, 1 = No faults present
Notes / Verbose description		
Checks if there is any faults present in the device. Uses sAmpInfos protection bit and does not include bit 10 and 11 of Amp Status. *Note*: Frame must be **ON** for this to be valid.		

Command syntax	GET	SET	DO	Support	Description

Dev.MD.FullBin	X			D Series & PLM+ 2.36, PLM 2.58 & 2.74	Retrieves a full meter data structure as binary data.

Operation	Parameters	Range / Resolution
?	<DLM protocol Version>	1-x. (2 for PLM, 3 for D Series & PLM+) Version 1 is assumed if the parameter is left out. Version parameter is only valid if FW is at least 2.74
Reply:	<Binary meter data structure>	See "Appendix B: Full meter data binary structure" for complete information.

Example

"Dev.MD.Fullbin?" - retrieves a full version 1 meter data binary (works for PLM firmware 2.58 and above)

"Dev.MD.Fullbin?2"- retrieves a full version 2 meter data binary (works for PLM firmware 2.74 and above)

"Dev.MD.Fullbin?3"- retrieves a full version 3 meter data binary (works for D Series & PLM+ firmware)

Note: Frame must be **ON** for this to be valid.

Command syntax	GET	SET	DO	Support	Description
Dev.MD.FullBin	X			LM 0.32	Retrieves a full meter data structure as binary data

Operation	Parameters	Range / Resolution
?		
Reply:	<Binary meter data structure>	See "Appendix B: Full meter data binary structure" for complete information.

8.3.13 Pilot Tone Generation 1 (Dev.PTG)

Command syntax	GET	SET	DO	Support	Description
Dev.PTG.Active	X	X		PLM 2.58	Activates / deactivates pilot tone generation for power channel. Only PLM 10000Q and 14000

Operation	Parameters	Range / Resolution
?	<Power channel>	1-4
Reply:	<PTG State>	1 = Active, 0 = Not active
Operation	Parameters	Range / Resolution
=	<Power channel> <PTG State>	1-4 1 = Activate, 0 = Deactivate
Reply:	Ack	

Example

"Dev.PTG.Active = 2 1" - activates pilot tone for power output 2

Notes / Verbose description

Activates or deactivates pilot tone for a given power channel. Make sure that pilot tone is correctly configured before activation!

Command syntax	GET	SET	DO	Support	Description
Dev.PTG.Impedance	X			PLM 2.58	Impedance measurement. Only PLM 10000Q and 14000

Operation	Parameters	Range / Resolution
?	<Power channel>	1-4 This parameter is optional. If omitted, impedance is returned for all physical output channels.
Reply:	<Imp.> <Imp.> <Imp.> <Imp.>	In ohms with one decimal, formatted X.X ranging from 0.0 ohms to 6000.0 ohms. A '?' indicates that there are no value measured for a certain channel (PTG inactive).

Example

"Dev.PTG.Impedance? 1" - Get the average impedance for power channel 1
"7.3" - Reply shows measured impedance to be 7.3 ohms

Notes / Verbose description

Gets the current average impedance measurement for a power channel. The impedance is a ~1.5 seconds average absolute value of the complex impedance.

8.3.14 Pilot Tone Generation 2 (Dev.PTG2)

Command syntax	GET	SET	DO	Support	Description
Dev.PTG.Active	X	X		PLM 2.99	Activates / deactivates pilot tone generation for power channel. Only PLM 20000Q

Operation	Parameters	Range / Resolution
?	<Power channel>	1-4
Reply:	<PTG State>	1 = Active, 0 = Not active

Operation	Parameters	Range / Resolution
=	<Power channel> <PTG State>	1-4 1 = Activate, 0 = Deactivate
Reply:	Ack	

Example

"Dev.PTG2.Active = 2 1" - activates pilot tone v2 for power output 2

Notes / Verbose description

Activates or deactivates pilot tones for a given power channel. Make sure that pilot tone is correctly configured before activation!

Command syntax	GET	SET	DO	Support	Description
Dev.PTG.Impedance	X			PLM 2.58	Impedance measurement. Only PLM 20000Q

Operation	Parameters	Range / Resolution
?	<Power channel>	1-4 This parameter is optional. If omitted, impedance is returned for all power channels.
Reply:	<Imp.> <Imp.> <Imp.> <Imp.>	In ohms with one decimal, formatted X.X ranging from 0.0 ohms to 6000.0 ohms.

		A '?' indicates that there are no value measured for a certain channel (PTG inactive).

Example
"Dev.PTG.Impedance? 1" - Get the average impedance for power channel 1 "7.3" - Reply shows measured impedance to be 7.3 ohms
Notes / Verbose description
Gets the current average impedance measurement for a power channel. The impedance is a ~1.5 seconds average absolute value of the complex impedance.

8.3.15 LoadPilot

Command syntax	GET	SET	DO	Support	Description
Dev.LoadPilot.Enable	X	X		D Series & PLM+ 2.36	Activates / deactivates pilot tone generation for power channel

Operation	Parameters	Range / Resolution
?	<Power channel>	1-4
Reply:	<LoadPilot State>	1 = Enabled, 0 = Disabled
Operation	**Parameters**	**Range / Resolution**
=	<Power channel> <LoadPilot State>	1-4 1 = Enabled, 0 = Disabled
Reply:	Ack	

Example
"Dev.LoadPilot.Enable?2" – Gets the LoadPilot enabled state for power output 2 "Dev.LoadPilot.Enable=2 1" – Enables LoadPilot for power output 2 "Dev.LoadPilot.Enable=2 0" – Disables LoadPilot for power output 2
Notes / Verbose description
Gets the Enabled state or Enables/Disables pilot tones for a given power channel.

Command syntax	GET	SET	DO	Support	Description
Dev.LoadPilot.Readings	X			D Series & PLM+ 2.36	Readings for power channel

Operation	Parameters	Range / Resolution
?	<Power channel>	1-4
Reply:	<Tone 1 Impedance in ohm> <Tone 2 Impedance in ohm> <Tone 1 Current in mA> <Tone 2 Current in mA>	szString (xxxx)x.xx (range 0.00-10000.00) szString (xxxx)x.xx (range 0.00-10000.00) szString (xx)x.xxx (range 0.000-?.???) szString (xx)x.xxx (range 0.000-?.???)
Reply:	Ack	

Example
"Dev.LoadPilot.Readings?4" – Reads out the values for power output 4
Notes / Verbose description
Reads out the last impedance and current values for a given power channel.

Command syntax	GET	SET	DO	Support	Description

Dev.LoadPilot.Signal				D Series & PLM+ 2.36	Signal setting

Operation	Parameters	Range / Resolution
?	<Power channel>	1-4
Reply:	<Tone 1 Frequency in Hz>	szString (xxxx)x (range 10-10)
	<Tone 2 Frequency in Hz>	szString (xxxx)x (range 24000-24000)
	<Tone 1 Amplitude in V>	szString x.xxx (range 0.000-2.000)
	<Tone 2 Amplitude in V>	szString x.xxx (range 0.000-2.000)
Operation	Parameters	Range / Resolution
=	<Power channel>	1-4
	<Tone 1 Frequency in Hz>	szString (xxxx)x (range 10-10)
	<Tone 2 Frequency in Hz>	szString (xxxx)x (range 24000-24000)
	<Tone 1 Amplitude in V>	szString x.xxx (range 0.000-2.000)
	<Tone 2 Amplitude in V>	szString x.xxx (range 0.000-2.000)
Reply:	Ack	

Example

"Dev.LoadPilot.Signal?4" – Gets LoadPilot signal for power output 4

"Dev.LoadPilot.Signal=4 10 24000 0.050 0.030" – Sets LoadPilot signal for power output 4

Notes / Verbose description

Gets or sets the frequency and amplitude of the two sinusoid signals used in LoadPilot.

Command syntax	GET	SET	DO	Support	Description
Dev.LoadPilot.Threshold	X	X		D Series & PLM+ 2.36	Gets or sets the impedance thresholds.

Operation	Parameters	Range / Resolution
?	<Power channel>	1-4
Reply:	<Tone 1 Lower Threshold in ohm>	szString (xxxx)x.xx (range 0.00-10000.00)
	<Tone 2 Lower Threshold in ohm>	szString (xxxx)x.xx (range 0.00-10000.00)
	<Tone 1 Upper Threshold in ohm>	szString (xxxx)x.xx (range 0.00-10000.00)
	<Tone 2 Upper Threshold in ohm>	szString (xxxx)x.xx (range 0.00-10000.00)
Operation	Parameters	Range / Resolution
=	<Power channel>	1-4
	<Tone 1 Lower Threshold in ohm>	szString (xxxx)x.xx (range 0.00-10000.00)
	<Tone 2 Lower Threshold in ohm>	szString (xxxx)x.xx (range 0.00-10000.00)
	<Tone 1 Upper Threshold in ohm>	szString (xxxx)x.xx (range 0.00-10000.00)
	<Tone 2 Upper Threshold in ohm>	szString (xxxx)x.xx (range 0.00-10000.00)
Reply:	Ack	

Example

"Dev.LoadPilot.Threshold?4" – Gets impedance thresholds for power output 4

"Dev.LoadPilot.Threshold=4 0.80 0.80 330 330" – Sets impedance thresholds for power output 4

8.4 Module commands

8.4.1 Output channel

Command syntax	GET	SET	DO	Support	Description
Mod.Out.Mute	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Mute module output channel

Type	Parameters	Range/resolution
?	<Module> <Ch>	MODULE_ENUM 1-6
Reply:	<Mute>	1=Muted, 0=Unmuted

Type	Parameters	Range/resolution
=	<Module> <Ch> <Mute>	MODULE_ENUM 1-6 1=Muted, 0=Unmute
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.Gain	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Control module output gain

Type	Parameters	Range/resolution
?	<Module> <Ch>	MODULE_ENUM 1-6
Reply:	<Gain in dB> <GroupSum in dB> <SumMin in dB> <SumMax in dB>	szString (-xx)x.xx (range -100.00 - 20.00) szString (-xx)x.xx (range -100.00 - 20.00) szString (-xx)x.xx (range -100.00 - 20.00) szString (-xx)x.xx (range -100.00 - 20.00)

Type	Parameters	Range/resolution
=	<Module> <Ch> <Gain in dB>	MODULE_ENUM 1-6 szString (-xx)x.xx (range -100.00 - 20.00)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.Delay	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Control module output delay

Type	Parameters	Range/resolution
?	<Module> <Ch>	MODULE_ENUM 1-6
Reply:	<Delay in ms> <GroupSum in ms> <SumMin in ms> <SumMax in ms>	szString (xxx)x.xx (range 0.00-100.00) szString (xxx)x.xx (range 0.00-100.00) szString (xxx)x.xx (range 0.00-100.00) szString (xxx)x.xx (range 0.00-100.00)

Type	Parameters	Range/resolution
=	<Module>	MODULE_ENUM
	<Ch>	1-6
	<Delay in ms>	szString (xxx)x.xx (range 0.00-100.00)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.MaxRMSLvl	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max RMS Level

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
	<Ch>	1-6
Reply:	<MaxRMS Level in dB>	szString (-x)x.xx (range -30.00 - 30.00)
	<GroupSum in dB>	szString (-x)x.xx (range -30.00 - 30.00)
	<SumMin in dB>	szString (-x)x.xx (range -30.00 - 30.00)
	<SumMax in dB>	szString (-x)x.xx (range -30.00 - 30.00)

Type	Parameters	Range/resolution
=	<Module>	MODULE_ENUM
	<Ch>	1-6
	<MaxRMS Level in dB>	szString (-x)x.xx (range -30.00 - 30.00)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.MaxRMSCor	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max RMS Corner

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
	<Ch>	1-6
Reply:	<MaxRMS Corner in dB>	szString (-xx)x.xx (range -100.00 – 0.00)
	<MaxRMS Corner Min in dB>	szString (-xx)x.xx (range -100.00 – 0.00)
	<MaxRMS Corner Max in dB>	szString (-xx)x.xx (range -100.00 – 0.00)

Type	Parameters	Range/resolution
=	<Module>	MODULE_ENUM
	<Ch>	1-6
	<MaxRMS Corner in dB>	szString (-xx)x.xx (range -100.00 – 0.00)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.MaxRMSAtk	X	X		D Series & PLM+ 2.36,	Max RMS Attack

				PLM 2.58, LM 0.32	

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
	<Ch>	1-6
Reply:	<MaxRMS Attack in ms>	szString (xx)x.xx (range 1.00-500.00)
	<MaxRMS Attack Min in ms>	szString (xx)x.xx (range 1.00-500.00)
	<MaxRMS Attack Max in ms>	szString (xx)x.xx (range 1.00-500.00)

Type	Parameters	Range/resolution
=	<Module>	MODULE_ENUM
	<Ch>	1-6
	<MaxRMS Attack in ms>	szString (xx)x.xx (range 1.00-500.00)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.MaxRMSRel				D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max RMS Release

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
	<Ch>	1-6
Reply:	<MaxRMS Release in ms>	szString (xx)x.xx (range 1.00-500.00)
	<MaxRMS Release Min in ms>	szString (xx)x.xx (range 1.00-500.00)
	<MaxRMS Release Max in ms>	szString (xx)x.xx (range 1.00-500.00)

Type	Parameters	Range/resolution
=	<Module>	MODULE_ENUM
	<Ch>	1-6
	<MaxRMS Release in ms>	szString (xx)x.xx (range 1.00-500.00)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.MaxPeakLvl	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Max Peak level

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
	<Ch>	1-6
Reply:	<MaxPeak Level in dB>	szString (-x)x.xx (range -30.00 - 30.00)
	<GroupSum in dB>	szString (-x)x.xx (range -30.00 - 30.00)
	<SumMin in dB>	szString (-x)x.xx (range -30.00 - 30.00)
	<SumMax in dB>	szString (-x)x.xx (range -30.00 - 30.00)

Type	Parameters	Range/resolution
=	<Module>	MODULE_ENUM
	<Ch>	1-6

	<MaxPeak Level in dB>	szString (-x)x.xx (range -30.00 - 30.00)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.Phase	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Output polarity

Type	Parameters	Range/resolution
?	<Module> <Ch>	MODULE_ENUM 1-6
Reply:	<Phase> <Lock>	1=Positive,0=Negative 1=Locked, 0=Not Locked
Type	Parameters	Range/resolution
=	<Module> <Ch> <Phase>	MODULE_ENUM 1-6 1=Positive,0=Negative
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.Label	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Module output label

Type	Parameters	Range/resolution
?	<Module> <Ch>	MODULE_ENUM 1-6
Reply:	<Label>	szString[32]
Type	Parameters	Range/resolution
=	<Module> <Ch> <Label>	MODULE_ENUM 1-6 szString[32]
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.AmpGain				D Series & PLM+ 2.36, PLM 2.58	Module output amplifier gain

Type	Parameters	Range/resolution
?	<Module> <Ch>	MODULE_ENUM 1-6
Reply:	<AmpGain in dB> <AmpGain Min in dB> <AmpGain Max in dB>	szString xx (range 22-44) szString xx (range 22-44) szString xx (range 22-44)
Type	Parameters	Range/resolution

=	<Module> <Ch> <AmpGain in dB>	MODULE_ENUM 1-6 szString xx (range 22-44)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.AmpVPL				D Series & PLM+ 2.36, PLM 2.58	Voltage peak limit

Type	Parameters	Range/resolution
?	<Module> <Ch>	MODULE_ENUM 1-6
Reply:	<Desired VPL in V> <VPL Min in V> <VPL Max in V> <Actual VPL in V>	szString (x)xx.x (range 17.8-193.0) szString (x)xx.x (range 17.8-193.0) szString (x)xx.x (range 17.8-193.0) szString (x)xx.x (range 17.8-193.0)

Type	Parameters	Range/resolution
=	<Module> <Ch> <Desired VPL in V>	MODULE_ENUM 1-6 szString (x)xx.x (range 17.8-193.0)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.VPLProfile				D Series & PLM+ 2.36, PLM 2.58	Voltage peak limit profile

Type	Parameters	Range/resolution
?	<Module> <Ch>	MODULE_ENUM 1-6
Reply:	<VPL Profile>	0=Universal, 1=Sub/LF, 2=Sub, 3=LF, 4=MF, 5=HF

Type	Parameters	Range/resolution
=	<Module> <Ch> <VPL Profile>	MODULE_ENUM 1-6 0=Universal, 1=Sub/LF, 2=Sub, 3=LF, 4=MF, 5=HF
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Out.Chans				D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Returns the number of output channels for a module

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM

Reply:	<Channels>	1-6

8.4.2 Mixer

Command syntax	GET	SET	DO	Support	Description
Mod.In.MixerGain	X	X		D Series & PLM+ 2.36, LM 0.32	Module input mixer gain

Type	Parameters	Range/resolution
?	<Module> <Channel>	MODULE_ENUM 1-4 (for input router 1-4 in mixer for module)
Reply:	<Gain in dB>	szString (-xx)x.xx (range -100.00 - 15.00)
Type	Parameters	Range/resolution
=	<Module> <Channel> <Gain in dB>	MODULE_ENUM 1-4 szString (-xx)x.xx (range -100.00 - 15.00)
Reply:	Ack	

8.4.3 Input channel

Command syntax	GET	SET	DO	Support	Description
Mod.In.Mute	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Mute module input channel

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
Reply:	<Mute>	1=Muted, 0=Unmuted
Type	Parameters	Range/resolution
=	<Module> <Mute>	MODULE_ENUM 1=Muted, 0=Unmuted
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.In.Gain	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Control module input gain

Type	Parameters	Range/resolution
?	<Module	MODULE_ENUM
Reply:	<Gain in dB> <GroupSum in dB> <SumMin in dB> <SumMax in dB>	szString (-xx)x.xx (range -100.00 - 15.00) szString (-xx)x.xx (range -100.00 - 15.00) szString (-xx)x.xx (range -100.00 - 15.00) szString (-xx)x.xx (range -100.00 - 15.00)
Type	Parameters	Range/resolution
=	<Module> <Gain in dB>	MODULE_ENUM szString (-xx)x.xx (range -100.00 - 15.00)

Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.In.Delay	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Control module input delay

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
Reply:	<Delay in ms> <GroupSum in ms> <SumMin in ms> <SumMax in ms>	szString (xxx)x.xx (range 0.00-1800.00) szString (xxx)x.xx (range 0.00-1800.00) szString (xxx)x.xx (range 0.00-1800.00) szString (xxx)x.xx (range 0.00-1800.00)
Type	Parameters	Range/resolution
=	<Module> <Delay in ms>	MODULE_ENUM szString (xxx)x.xx (range 0.00-1800.00)
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.In.Phase	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Input polarity

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
Reply:	<Phase>	0=Negative, 1=Positive
Type	Parameters	Range/resolution
=	<Module> <Phase>	MODULE_ENUM 0=Negative, 1=Positive
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.In.Label	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Module input label

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
Reply:	<Label>	szString[32]
Type	Parameters	Range/resolution
=	<Module> <Label>	MODULE_ENUM szString[32]
Reply:	Ack	

8.4.4 Module

Command syntax	GET	SET	DO	Support	Description
Mod.Mod.Label	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Module label

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
Reply:	<Label>	szString[32]
Type	**Parameters**	**Range/resolution**
=	<Module> <Label>	***MODULE_ENUM*** szString[32]
Reply:	Ack	

Command syntax	GET	SET	DO	Support	Description
Mod.Mod.Selected	X	X		D Series & PLM+ 2.36, PLM 2.58, LM 0.32	Use to indicate to PC and on front that module is selected.

Type	Parameters	Range/resolution
?	<Module>	MODULE_ENUM
Reply:	<Selected>	0=Not selected, 1=Selected
Type	**Parameters**	**Range/resolution**
=	<Module> <Selected>	MODULE_ENUM 0=Not selected, 1=Selected
Reply:	Ack	

9 Appendix B: Full meter data binary structure

9.1 PLM protocol Version 1 (FW Version 2.58 and above)

Field	Name	Size	Comment
sAMPInfo	AMP Information	36 Bytes	**See 9.1.2**
uPeakA	Peak value module A	1 Bytes	Peak and RMS values for module inputs. 0xFF=ADO/AES fullscale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uRMSA	RMS value module A	1 Bytes	
uPeakB	Peak value module B	1 Bytes	
uRMSB	RMS value module B	1 Bytes	
uStatus	Status information	4 Bytes	**See 9.1.1**
uPeak1	Peak value physical In 1	1 Bytes	
uRMS1	RMS value physical In 1	1 Bytes	
uPeak2	Peak value physical In 2	1 Bytes	
uRMS2	RMS value physical In 2	1 Bytes	

9.1.1 uStatus field

uStatus	Bit	Comment
LINK_1	0	Ethernet 1 link status, 1=Network connected (Link), 0=No connection to network
LINK_2	1	Ethernet 2 link status, 1=Network connected (Link), 0=No connection to network
RESERVED	2-3	Unused bits should be set to 0
CTRL_PRESENT	4	1=Controller present on network, 0=No controller present on network
AD_DATA_FAIL	5	1=AD data encoding violation, 0=No violation.
RESERVED	6-7	Unused bits should be set to 0
ModA_1	8	Module A input 1, 1=Connected, 0=Not Connected
ModA_2	9	Module A input 2, 1=Connected, 0=Not Connected
ModB_1	10	Module B input 1, 1=Connected, 0=Not Connected
ModB_2	11	Module B input 2, 1=Connected, 0=Not Connected
RESERVED	12-15	Unused bits should be set to 0
OUTPUT_CLIP_A	16-21	6 bits, each bit indicates the clip state of Module A output channels
OUTPUT_CLIP_B	22-27	6 bits, each bit indicates the clip state of Module B output channels
RESERVED	28-31	Unused bits should be set to 0

9.1.2 Amp Info

All Amp data is peak and hold (worst value kept until read).

Amp Meter data (sAmpInfo)			
Bytes Bit 31-24	Bit 23-16	Bit 15-8	Bit 7-0
Reserved		Amp Status	
ChA Status			
ChA Power	ChA Voltage	ChA Current	ChA Gain Reduction
ChB Status			
ChB Power	ChB Voltage	ChB Current	ChB Gain Reduction
ChC Status			
ChC Power	ChC Voltage	ChC Current	ChC Gain Reduction
ChD Status			
ChD Power	ChD Voltage	ChD Current	ChD Gain Reduction

Note: Data will be capped between -127dB (0x00) and -60dB (0x7F) and will in this interval always be displayed as -127dB (0x00).

9.1.2.1 Amp Status

Amp Status			
Bit number	Parameter	Severity	Description
15	Reserved	-	-
14	DLM selected	Status	Indicates that the DLM is selected. (Selection is done by pressing the appropriate button on the front panel).
13	DLM dirty	Status	Indicates that data in the DLM has been changed and should be re-read by the external host.
12	Sense warning	Warning	There is no activity in voltage and current sense on any channel when power is ON.
11	Board Data Fault	Fault	Flash checksum error in host.
10	AD Data Fault	Fault	AD encoding error in host.
8-9	Slot temperature	Fault	Temp warning indicator for DSP area 0x00 No Warning 0x01 Not used 0x02 Fault
7	Protect	Fault	Active if any channel in protective mode.
6	Load monitor	Status	There is an ongoing load monitor measurement.
5-4	Power Supply Temperature	Fault	Temp warning indicator. 0x00 No Warning 0x01 Not used 0x02 Fault
3	Audio In Fault	Fault	Deactivated Audio OK/ or missing audio clocks.
2	PAL	Fault	Active limitation of mains input due to risk of braking mains fuse.
1	Power Supply Failure	Fault	Main power supply failing.
0	Power Status	Status	Actual power state ON/OFF (Delayed).

9.1.2.2 Channel Status

Channel Status

<table>
<tr><th>Bit number</th><th>Parameter</th><th>Severity</th><th>Description</th></tr>
<tr><td>31</td><td>Service</td><td>Fault</td><td>Amp channel needs service fault</td></tr>
<tr><td>30</td><td>VHF</td><td>Fault</td><td>Very High Frequency Fault</td></tr>
<tr><td>29</td><td>Short Circuit</td><td>Fault</td><td>Short Circuit Fault.</td></tr>
<tr><td>28-27</td><td>Temp</td><td>Warning/Fault</td><td>Temp warning indicator<table><tr><td>0x00</td><td>No Warning</td></tr><tr><td>0x01</td><td>Warning</td></tr><tr><td>0x02</td><td>Fault</td></tr></table></td></tr>
<tr><td>26</td><td>Open Load</td><td>Warning</td><td>Load monitor detected no load.</td></tr>
<tr><td>25</td><td>U_{clip}</td><td>Status</td><td>Voltage Clip</td></tr>
<tr><td>24</td><td>I_{clip}</td><td>Status</td><td>Current Clip</td></tr>
<tr><td>23</td><td>Correct</td><td>Status</td><td>Load monitor correct speaker is connected.</td></tr>
<tr><td>22</td><td>Wrong</td><td>Fault</td><td>Load monitor wrong speaker is connected.</td></tr>
<tr><td>21</td><td>Not Verified</td><td>Warning</td><td>Load monitor has not verified the speakers.</td></tr>
<tr><td>20</td><td>No Ident Model</td><td>Warning</td><td>Load monitor has no identification model.</td></tr>
<tr><td>19</td><td>No Temp Model</td><td>Warning</td><td>Load monitor has no temperature model.</td></tr>
<tr><td>18</td><td>Voice Coil Temp Fault</td><td>Fault</td><td>Load monitor voice coil temperature fault.</td></tr>
<tr><td>17</td><td>Cabinet damaged
Voice Coil Temp Warning</td><td>Warning</td><td>A loudspeaker component is either shorted or open
~~Load monitor voice coil temperature warning.~~</td></tr>
<tr><td>16</td><td>Mag Temp Fault</td><td>Fault</td><td>Load monitor speaker magnet temperature fault.</td></tr>
<tr><td>15</td><td>Cabinet shorted
~~Mag Temp Warning~~</td><td>Warning</td><td>There is a short far away from the amplifier.
Load monitor speaker magnet temperature warning.</td></tr>
<tr><td>14</td><td>Less Speakers</td><td>Warning</td><td>Load monitor detected less speakers than expected.</td></tr>
<tr><td>13</td><td>More Speakers</td><td>Warning</td><td>Load monitor detected more speakers than expected.</td></tr>
<tr><td>12</td><td>Model Prec Low</td><td>Warning</td><td>Load monitor model precision is low.</td></tr>
<tr><td>11</td><td>Uncertain</td><td>Warning</td><td>Load monitor is uncertain if correct load is connected or not.</td></tr>
<tr><td>10</td><td>CAL</td><td>Warning</td><td>Current average limiter is active</td></tr>
<tr><td>9</td><td>Live not started</td><td>Warning</td><td>Live part of load monitor has not been started</td></tr>
<tr><td>8</td><td>Reserved</td><td>N/A</td><td>Reserved for future use.</td></tr>
<tr><td>7-0</td><td>VoltageRMS</td><td>Value</td><td>Voltage RMS<table><tr><th>Value</th><th>Description</th></tr><tr><td>0xFF</td><td>RMS of Max Out Voltage</td></tr><tr><td>0xFE</td><td>0.5dB from RMS of Max Out Voltage</td></tr><tr><td>….</td><td>….</td></tr><tr><td>0x00</td><td>-Infinity from RMS of Max Out Voltage or below noise floor</td></tr></table></td></tr>
</table>

9.1.2.3 Channel Power

Channel Power

Value	Description
0xFF	Max power into the attached nominal load
0xFE	-0,5 dB relative to Max power
….	….
0x01	-127 dB relative to Max Power
0x00	Below noise floor

9.1.2.4 Channel Voltage

Channel Voltage	
Value	Description
0xFF	Max Out Voltage
0xFE	0.5dB from Max Out Voltage
….	….
0x00	-Infinity from Max Out Voltage or below noise floor

9.1.2.5 Channel Current

Channel Current	
Value	Description
0xFF	Max Out Current
0xFE	0.5dB from Max Out Current
….	….
0x00	-Infinity from Max Out Current or below noise floor

9.1.2.6 Channel Gain Reduction

Channel Gain Reduction	
Value	Description
0xFF	Reserved
0xFE	25.4 dB Gain reduction
….	….
0x01	0.1 dB Gain reduction
0x00	No gain reduction

9.2 PLM protocol Version 2 (FW Version 2.74 and above)

Field	Name	Size	Comment
sAMPInfo	AMP Information	60 Bytes	**See 9.2.2**
uPeakA	Peak value module A	1 Bytes	Peak and RMS values for module inputs. 0xFF=ADO/AES fullscale
uRMSA	RMS value module A	1 Bytes	

uPeakB	Peak value module B	1 Bytes	(overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uRMSB	RMS value module B	1 Bytes	
uStatus	Status information	4 Bytes	**See 9.2.1**
uPeak1	Peak value physical In 1	1 Bytes	
uRMS1	RMS value physical In 1	1 Bytes	
uPeak2	Peak value physical In 2	1 Bytes	
uRMS2	RMS value physical In 2	1 Bytes	
uPeakGrModOut1	Peak g.r.v. out ch. 1	1 Bytes	Peak gain reduction values for output channels. 0xFF = 25.5 dB gain reduction 0xFE = 25.0 dB, 0x01 = 0.1 dB 0x00 = 0 dB gain reduction
uPeakGrModOut2	Peak g.r.v. out ch. 2	1 Bytes	
uPeakGrModOut3	Peak g.r.v. out ch. 3	1 Bytes	
uPeakGrModOut4	Peak g.r.v. out ch. 4	1 Bytes	
uRMSGrModOut1	RMS g.r.v. out ch. 1	1 Bytes	RMS gain reduction values for output channels. 0xFF = 25.5 dB gain reduction 0xFE = 25.0 dB, 0x01 = 0.5 dB 0x00 = 0 dB gain reduction
uRMSGrModOut2	RMS g.r.v. out ch. 2	1 Bytes	
uRMSGrModOut3	RMS g.r.v. out ch. 3	1 Bytes	
uRMSGrModOut4	RMS g.r.v. out ch. 4	1 Bytes	
uStatus2	Status information 2	4 Bytes	Reserved

9.2.1 uStatus field

uStatus	Bit	Comment
LINK_1	0	Ethernet 1 link status, 1=Network connected (Link), 0=No connection to network
LINK_2	1	Ethernet 2 link status, 1=Network connected (Link), 0=No connection to network
RESERVED	2-3	Unused bits should be set to 0
CTRL_PRESENT	4	1=Controller present on network, 0=No controller present on network
AD_DATA_FAIL	5	1=AD data encoding violation, 0=No violation.
CLOCK_SLIP_AES	6	1=AES clock slipping, 0=Clock ok
CLOCK_SLIP_DANTE	7	1=DANTE clock slipping, 0=Clock ok
ModA_1	8	Module A input 1, 1=Connected, 0=Not Connected
ModA_2	9	Module A input 2, 1=Connected, 0=Not Connected
ModB_1	10	Module B input 1, 1=Connected, 0=Not Connected
ModB_2	11	Module B input 2, 1=Connected, 0=Not Connected
DANTE_MASTER	12	1=Unit is DANTE clock master, 0=Slave
RESERVED	13-15	Unused bits should be set to 0

OUTPUT_CLIP_A	16-21	6 bits, each bit indicates the clip state of Module A output channels
OUTPUT_CLIP_B	22-27	6 bits, each bit indicates the clip state of Module B output channels
RESERVED	28-31	Unused bits should be set to 0

9.2.2 Amp Info

All Amp data is peak and hold (worst value kept until read).

Amp Meter data (sAmpInfo)			
Bytes Bit 31-24	Bit 23-16	Bit 15-8	Bit 7-0
PSU Mains Input		Amp Status	
ChA Status			
ChA Power	ChA Voltage	ChA Current	ChA Gain Reduction
ChB Status			
ChB Power	ChB Voltage	ChB Current	ChB Gain Reduction
ChC Status			
ChC Power	ChC Voltage	ChC Current	ChC Gain Reduction
ChD Status			
ChD Power	ChD Voltage	ChD Current	ChD Gain Reduction
PSU Model Limit	PSU BEL Limit	PSU UVL Limit	PSU Current Limit Activity
PSU Peak Current	PSU Average Current	PSU Peak Power	PSU Average Power
ChA Temp Limit	ChB Temp Limit	ChC Temp Limit	ChD Temp Limit
PSU Temp Limit	PSU Vcap Limit	PSU Status	
ChA Ext Status	ChB Ext Status	ChC Ext Status	ChD Ext Status
Amp Ext Status			

Note: For Channel Power, Voltage and Current data will be capped between -127dB (0x00) and -60dB (0x7F) and will in this interval always be displayed as -127dB (0x00).

9.2.2.1 PSU Mains Input

This block is only defined for PLM20000Q and is otherwise not valid.

Bit number	Parameter	Severity	Description
15-8	PSU Mains current		Mains current RMS Value / Description 0x00 / 0 % of Max input current 0x01 / 0.5 % of Max input current 0x02 / 1.0% of Max input current …. / …. 0xFF / 127.5 % of Max input current
7-0	PSU Mains Voltage		Mains voltage RMS (43-413V) according to the following formula: $y = \max(0, \min(x, 275) + \max(0, \frac{x-275}{6}) - 43)$

Value (y)	Voltage (x)
0x00	≤ 43 VRMS
0x01	44 VRMS
.	….
0xE7	274 VRMS
0xE8	275 VRMS
0xEE	281 VRMS
…	…
0xFE	407 VRMS
0xFF	≥ 413 VRMS

9.2.2.2 Amp Status

Amp Status			
Bit number	Parameter	Severity	Description
15	Reserved		Value is zero
14	Reserved for LP2D as DLM selected	Status	Indicates that the DLM is selected. (Selection is done by pressing the appropriate button on the front panel)
13	Reserved for LP2D as DLM dirty	Status	Indicates that data in the DLM has been changed and should be reread by the external host.
12	Sense warning	Warning	There is no activity in voltage and current sense on any channel when power is ON
11	Reserved for LP2D as Board Data Fault	Fault	Flash checksum error in host.
10	Reserved for LP2D as AD Data Fault	Fault	AD encoding error in host.
8-9	DSP area temperature	Fault	Temp warning indicator for DSP area 0x00 No Warning 0x01 Warning 0x02 Not used 0x03 Fault
7	Protect	Fault	Active if any channel in protective mode.
6	Load monitor	Status	There is an ongoing load monitor measurement.
5-4	Power Supply Temperature	Fault	Temp warning indicator. 0x00 No Warning 0x01 Warning ISVPL limit threshold reduced 0x02 Not used 0x03 Fault

3	Audio In Fault	Fault	Deactivated Audio OK/ or missing audio clocks.
2	PAL	PAL	Active limitation of mains input due to risk of braking mains fuse. This flag is valid only for PLM1000Q and PLM14000. For PLM20000Q see PSU status block below.
1	Power Supply Failure	Fault	Mains power supply failing.
0	Power Status	Status	Actual power state ON/OFF (Delayed).

9.2.2.3 Channel Status

Channel Status			
Bit number	Parameter	Severity	Description
31	Service	Fault	Amp channel needs service fault
30	VHF	Fault	Very High Frequency Fault
29	Short Circuit	Fault	Short Circuit Fault.
28-27	Temp	Warning/Fault	Temp warning indicator 0x00 No Warning 0x01 Warning 0x02 Fault
26	Open Load	Warning	Load monitor detected no load.
25	U_{clip}	Status	Voltage Clip
24	I_{clip}	Status	Current Clip
23	Correct	Status	Load monitor correct speaker is connected.
22	Wrong	Fault	Load monitor wrong speaker is connected.
21	Not Verified	Warning	Load monitor has not verified the speakers.
20	No Ident Model	Warning	Load monitor has no identification model.
19	No Temp Model	Warning	Load monitor has no temperature model.
18	Voice Coil Temp Fault	Fault	Load monitor voice coil temperature fault.
17	Cabinet damaged	Warning	A loudspeaker component is either shorted or open
16	Mag Temp Fault	Fault	Load monitor speaker magnet temperature fault.
15	Cabinet shorted	Warning	There is a short far away from the amplifier.
14	Less Speakers	Warning	Load monitor detected less speakers than expected.
13	More Speakers	Warning	Load monitor detected more speakers than expected.
12	Model Prec Low	Warning	Load monitor model precision is low.
11	Uncertain	Warning	Load monitor is uncertain if correct load is connected or not.
10	CAL	Warning	Current avarage limiter is active
9	Live not started	Warning	Live part of load monitor has not been started
8	Reserved	N/A	Reserved for future use.
7-0	VoltageRMS	Value	Voltage RMS Value: 0xFF — Description: RMS of Max Out Voltage

			0xFE	0.5dB from RMS of Max Out Voltage
			….	….
			0x00	-Infinity from RMS of Max Out Voltage or below noise floor

9.2.2.4 Channel Power

Channel Power	
Value	Description
0xFF	Max power into the attached nominal load
0xFE	-0,5 dB relative to Max power
….	….
0x01	-127 dB relative to Max Power
0x00	Below noise floor

9.2.2.5 Channel Voltage

Channel Voltage	
Value	Description
0xFF	Max Out Voltage
0xFE	0.5dB from Max Out Voltage
….	….
0x00	-Infinity from Max Out Voltage or below noise floor

9.2.2.6 Channel Current

Channel Current	
Value	Description
0xFF	Max Out Current
0xFE	0.5dB from Max Out Current
….	….
0x00	-Infinity from Max Out Current or below noise floor

9.2.2.7 Channel Gain Reduction

Channel Gain Reduction	
Value	Description
0xFF	Reserved
0xFE	25.4 dB Gain reduction
….	….
0x01	0.1 dB Gain reduction
0x00	No gain reduction

9.2.2.8 PSU Model Limit

A one byte value indicating the minimum value of the current limit enforced from the model power or current limit. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended as a roof in PSU power meters.

Value	Description
0xFF	63.75 A
0xFE	63.50 A
….	….
0x01	0.25 A
0x00	0 A

9.2.2.9 PSU BEL Limit

A one byte value indicating the minimum value of the current limit enforced from the external fuse protection. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended as a roof in PSU power meters

Value	Description
0xFF	63.75 A
0xFE	63.50 A
….	….
0x01	0.25 A
0x00	0 A

9.2.2.10 PSU UVL Limit

A one byte value indicating the minimum value of the current limit enforced during a mains under voltage condition. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended as a roof in PSU power meters

Value	Description
0xFF	63.75 A
0xFE	63.50 A
….	….
0x01	0.25 A
0x00	0 A

9.2.2.11 PSU Current Activity

A one byte value indicating the percentage of time during the last xx mains voltage cycles that one of the current limits above actually limited the input current. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value can be used as a scale factor for PSU power meter roofs.

Value	Description
0x65 – 0xFF	Reserved
0x64	100 %
0x63	99 %
….	….
0x01	1 %
0x00	0 %

9.2.2.12 PSU Peak Current

A one byte value indicating the maximum value of the mains input peak current. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended for PSU power meters.

Value	Description
0xFF	63.75 A
0xFE	63.50 A
….	….
0x01	0.25 A
0x00	0 A

9.2.2.13 PSU Average Current

A one byte value indicating the maximum value of the mains input average current. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended for PSU power meters.

Value	Description
0xFF	63.75 A
0xFE	63.50 A
….	….
0x01	0.25 A
0x00	0 A

9.2.2.14 PSU Peak Power

A one byte value indicating the maximum value of the mains input peak power. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended for PSU power meters.

Value	Description
0xFF	8160 W
0xFE	8128 W
….	….
0x01	32 W
0x00	0 W

9.2.2.15 PSU Average Power

A one byte value indicating the maximum value of the mains input average power. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended for PSU power meters.

Value	Description
0xFF	8160 W
0xFE	8128 W
….	….
0x01	32 W
0x00	0 W

9.2.2.16 Channel Temp Limit

A one byte value indicating the ISVPL threshold decrease factor for module temp SMGO in dB relative the ISVPL threshold for each channel. The value is intended as a roof in output meters.

Value	Description
0xFF	Reserved
0xFE	-25.4 dB ISVPL threshold decrease
….	….
0x01	-0.1 dB ISVPL threshold decrease
0x00	No ISVPL threshold decrease

9.2.2.17 PSU Temp Limit

A one byte value indicating the ISVPL threshold decrease factor for PSU temp SMGO in dB relative the ISVPL threshold for each channel. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended as a roof in output meters.

Value	Description
0xFF	Reserved
0xFE	-25.4 dB ISVPL threshold decrease
….	….
0x01	-0.1 dB ISVPL threshold decrease
0x00	No ISVPL threshold decrease

9.2.2.18 PSU Vcap Limit

A one byte value indicating the ISVPL threshold decrease factor for Vcap SMGO in dB relative the ISVPL threshold for each channel. This block is only defined for PLM20000Q and is filled with zeros otherwise. The value is intended as a roof in output meters.

Value	Description
0xFF	Reserved
0xFE	-25.4 dB ISVPL threshold decrease
….	….
0x01	-0.1 dB ISVPL threshold decrease
0x00	No ISVPL threshold decrease

9.2.2.19 PSU Status Block

PSU fault and warning flags in a 16-bit data block. This block is only defined for PLM20000Q and is filled with zeros otherwise.

<table>
<tr><th>Bit number</th><th>Parameter</th><th>Severity</th><th>Description</th></tr>
<tr><td>15-12</td><td>PSU Needs Service reason</td><td>Fault</td><td>The PSU shutdown reason when non-zero. The mains power needs to be cycled in order to recover.
<table>
<tr><th>Value</th><th>INFO TEXT</th></tr>
<tr><td>0</td><td>-</td></tr>
<tr><td></td><td>No error, normal mode</td></tr>
<tr><td>1</td><td>NEEDS SERVICE:1</td></tr>
<tr><td>2</td><td>NEEDS SERVICE:2</td></tr>
<tr><td>3</td><td>NEEDS SERVICE:3</td></tr>
<tr><td>4</td><td>NEEDS SERVICE:4</td></tr>
<tr><td>5</td><td>NEEDS SERVICE:5</td></tr>
<tr><td>6</td><td>NEEDS SERVICE:6</td></tr>
<tr><td>7</td><td>NEEDS SERVICE:7</td></tr>
<tr><td>8</td><td>NEEDS SERVICE:8</td></tr>
</table></td></tr>
<tr><td rowspan="2">11</td><td rowspan="2">PSU Mains Glitch</td><td rowspan="2">Warning</td><td>MAINS GLITCH</td></tr>
<tr><td>A glitch on the mains voltage was detected. PSU was not turned off.</td></tr>
<tr><td rowspan="2">10</td><td rowspan="2">PSU Safe mode</td><td rowspan="2">Fault</td><td>PSU SAFE MODE</td></tr>
<tr><td>N/A</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Check AC Mains</td><td rowspan="2">Fault</td><td>CHECK AC MAINS</td></tr>
<tr><td>Retry in 10 seconds</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">PSU Power Limit</td><td rowspan="2">Warning</td><td>PAL</td></tr>
<tr><td>The output power is limited due to a mains input current limitation imposed by the maximum allowed input power</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">PSU Temp Limit</td><td rowspan="2">Warning</td><td>PTL</td></tr>
<tr><td>The output power is limited due to an overheat condition in the PSU</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Amp Temp Limit</td><td rowspan="2">Warning</td><td>ATL</td></tr>
<tr><td>The output power is limited due to an overheat condition in one or more output amplifier modules.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Fuse Current Limit</td><td rowspan="2">Warning</td><td>BEL</td></tr>
<tr><td>The output power is limited due to a mains input current limitation induced by the fuse model</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Under Voltage Limit</td><td rowspan="2">Warning</td><td>UVL</td></tr>
<tr><td>The output power is limited due to a mains input current limitation that is caused by a mains under voltage condition</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">PSU Rail Protect</td><td rowspan="2">Fault</td><td>PSU POWER PROT</td></tr>
<tr><td>Retry in 10 seconds</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Mains over voltage peak</td><td rowspan="2">Fault</td><td>MAINS >400Vpk</td></tr>
<tr><td>Mains peak voltage is too high for continued operation</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Mains over voltage RMS</td><td rowspan="2">Fault</td><td>MAINS >270V</td></tr>
<tr><td>Mains RMS voltage is too high for continued operation</td></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Mains Under voltage</td><td rowspan="2">Fault</td><td>MAINS <65V</td></tr>
<tr><td>Mains RMS voltage is too low for continued operation</td></tr>
</table>

9.2.2.20 Channel Ext Status

These 8 bit flags per amplifier channel extend the existing channel status with reserved bits for future use.

Bit number	Parameter	Severity	Description
0-7	Reserved		Reserved for future use

9.2.2.21 Amp Ext Status

These 32 bit flags per amplifier channel extend the existing channel status with reserved bits for future use.

Bit number	Parameter	Severity	Description
0-31	Reserved		Reserved for future use

9.3 D Series & PLM+ protocol Version 3 (FW Version 2.36 and above)

Field	Name	Size	Comment
sAMPInfo	AMP Information	60 Bytes	**See 9.2.2**
uStatus	Status information	4 Bytes	See 9.3.1
uInputConnectedA	Mixer connection	1 Byte	Bit[0] = 1 => Router 1 connected to mixer Bit[1] = 1 => Router 2… Bit[2] = 1 => Router 3… Bit[3] = 1 => Router 4…
uInputConnectedB	Mixer connection	1 Byte	
uInputConnectedC	Mixer connection	1 Byte	
uInputConnectedD	Mixer connection	1 Byte	
uModClipA	Module clip info	1 Byte	Bit[0] = 1 => Mod out 1 clip Bit[1] = 1 => Mod out 2 clip Bit[2] = 1 => Mod out 3 clip Bit[3] = 1 => Mod out 4 clip Bit[4] = 1 => Mod out 5 clip Bit[5] = 1 => Mod out 6 clip Bit[6] = 1 => Mod router clip Bit[7] = 1 => Mod input clip
uModClipB	Module clip info	1 Byte	
uModClipC	Module clip info	1 Byte	
uModClipD	Module clip info	1 Byte	
uPeak1	Peak value physical 1	1 Bytes	Peak values for physical inputs. 0xFF=ADO/AES full scale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uPeak2	Peak value physical 2	1 Bytes	
uPeak3	Peak value physical 3	1 Bytes	
uPeak4	Peak value physical 4	1 Bytes	
uRMS1	RMS value physical 1	1 Bytes	RMS values for physical inputs. 0xFF=ADO/AES full scale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uRMS2	RMS value physical 2	1 Bytes	
uRMS3	RMS value physical 3	1 Bytes	
uRMS4	RMS value physical 4	1 Bytes	
uPeakA	Peak value module A	1 Bytes	Peak values for module inputs. 0xFF=ADO/AES full scale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uPeakB	Peak value module B	1 Bytes	
uPeakC	Peak value module C	1 Bytes	
uPeakD	Peak value module D	1 Bytes	
uRMSA	RMS value module A	1 Bytes	RMS values for module inputs. 0xFF=ADO/AES full scale
uRMSB	RMS value module B	1 Bytes	
uRMSC	RMS value module C	1 Bytes	

uRMSD	RMS value module D	1 Bytes	(overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uPeakModOut1	Peak out ch. 1	1 Bytes	Peak values for output channels. 0xFF=ADO/AES full scale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uPeakModOut2	Peak out ch. 2	1 Bytes	
uPeakModOut3	Peak out ch. 3	1 Bytes	
uPeakModOut4	Peak out ch. 4	1 Bytes	
uRMSModOut1	RMS out ch. 1	1 Bytes	RMS values for output channels. 0xFF=ADO/AES full scale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uRMSModOut2	RMS out ch. 2	1 Bytes	
uRMSModOut3	RMS out ch. 3	1 Bytes	
uRMSModOut4	RMS out ch. 4	1 Bytes	
uPeakGrModOut1	Peak g.r.v. out ch. 1	1 Bytes	Peak gain reduction values for output channels. 0xFF = 25.5 dB gain reduction 0xFE = 25.0 dB, 0x01 = 0.1 dB 0x00 = 0 dB gain reduction
uPeakGrModOut2	Peak g.r.v. out ch. 2	1 Bytes	
uPeakGrModOut3	Peak g.r.v. out ch. 3	1 Bytes	
uPeakGrModOut4	Peak g.r.v. out ch. 4	1 Bytes	
uRMSGrModOut1	RMS g.r.v. out ch. 1	1 Bytes	RMS gain reduction values for output channels. 0xFF = 25.5 dB gain reduction 0xFE = 25.0 dB, 0x01 = 0.5 dB 0x00 = 0 dB gain reduction
uRMSGrModOut2	RMS g.r.v. out ch. 2	1 Bytes	
uRMSGrModOut3	RMS g.r.v. out ch. 3	1 Bytes	
uRMSGrModOut4	RMS g.r.v. out ch. 4	1 Bytes	
uStatus2	Status information 2	4 Bytes	Reserved

9.3.1 uStatus field

uStatus	Bit	Comment
LINK_1	0	Ethernet 1 link status, 1=Network connected (Link), 0=No connection to network
LINK_2	1	Ethernet 2 link status, 1=Network connected (Link), 0=No connection to network
RESERVED	2-3	Unused bits should be set to 0
CTRL_PRESENT	4	1=Controller present on network, 0=No controller present on network
AD_DATA_FAIL	5	1=AD data encoding violation, 0=No violation.
RESERVED	6	Unused bits should be set to 0
CLOCK_SLIP_DANTE	7	1=DANTE clock slipping, 0=Clock ok
CLOCK_SLIP_AES12	8	1=AES1-2 clock slipping, 0=Clock ok
CLOCK_SLIP_AES34	9	1=AES3-4 clock slipping, 0=Clock ok
RESERVED	10-11	Unused bits should be set to 0
DANTE_MASTER	12	1=Unit is DANTE clock master, 0=Slave
DEVICE_NAME_CONFLICT	13	
DANTE_MODULE_FAULT	14	
DANTE_MODULE_MISSING	15	
DANTE_MODULE_DISABLED	16	
DANTE_MODULE_FW_MISMATCH	17	
RESERVED	18-19	Unused bits should be set to 0
AD_PSU_FAIL	20	
DICO_COMM_FAULT	21	

RESERVED	22-31	Unused bits should be set to 0

9.4 LM protocol Version

Field	Name	Size	Comment
uStatus	Status information	4 Bytes	Status of host. See 9.4.1
(Spare)	(Reserved field)	4 Bytes	Reserved for future use.
uPeakRtrOut1	Peak value router out 1	1 Bytes	Peak values for input routers. 0xFF=ADO/AES fullscale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uPeakRtrOut2	Peak value router out 2	1 Bytes	
uPeakRtrOut3	Peak value router out 3	1 Bytes	
uPeakRtrOut4	Peak value router out 4	1 Bytes	
uPeakModInA	Peak value module in A	1 Bytes	Peak values for module inputs. 0xFF=ADO/AES fullscale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uPeakModInB	Peak value module in B	1 Bytes	
uPeakModOut1	Peak value module out 1	1 Bytes	Peak values for module outputs. 0xFF=ADO/AES fullscale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uPeakModOut2	Peak value module out 2	1 Bytes	
uPeakModOut3	Peak value module out 3	1 Bytes	
uPeakModOut4	Peak value module out 4	1 Bytes	
uPeakModOut5	Peak value module out 5	1 Bytes	
uPeakModOut6	Peak value module out 6	1 Bytes	
uPeakGrModOut1	Peak g.r.v. module out 1	1 Bytes	Peak gain reduction values for module outputs. 0xFF = 25.5 dB gain reduction 0xFE = 25.0 dB, 0x01 = 0.1 dB 0x00 = 0 dB gain reduction
uPeakGrModOut2	Peak g.r.v. module out 2	1 Bytes	
uPeakGrModOut3	Peak g.r.v. module out 3	1 Bytes	
uPeakGrModOut4	Peak g.r.v. module out 4	1 Bytes	
uPeakGrModOut5	Peak g.r.v. module out 5	1 Bytes	
uPeakGrModOut6	Peak g.r.v. module out 6	1 Bytes	
uRMSRtrOut1	RMS value router out 1	1 Bytes	RMS values for input routers. 0xFF=ADO/AES fullscale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uRMSRtrOut2	RMS value router out 2	1 Bytes	
uRMSRtrOut3	RMS value router out 3	1 Bytes	
uRMSRtrOut4	RMS value router out 4	1 Bytes	
uRMSModInA	RMS value module in A	1 Bytes	RMS values for module inputs. 0xFF=ADO/AES fullscale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uRMSModInB	RMS value module in B	1 Bytes	

uRMSModOut1	RMS value module out 1	1 Bytes	RMS values for module outputs. 0xFF=ADO/AES fullscale (overshoot), 0xFE=-0.5dBFS, 0x01=-127.0dBFS, 0x00=<-127dBFS
uRMSModOut2	RMS value module out 2	1 Bytes	
uRMSModOut3	RMS value module out 3	1 Bytes	
uRMSModOut4	RMS value module out 4	1 Bytes	
uRMSModOut5	RMS value module out 5	1 Bytes	
uRMSModOut6	RMS value module out 6	1 Bytes	
(Spare)	(Reserved field)	6 Bytes	Reserved for future use.

ModOut 1-6 are the more logical order of dsp processing, in a 3+3 1-3 is for modA and 4-6 is for modB, in a 4+2 1-4 is for modA and 5-6 is for modB, in 2+2 1-2 is for modA and 4-5 is for modB.

9.4.1 uStatus field

uStatus	Bit	Comment
LINK_1	0	Ethernet 1 link status, 1=Network connected (Link), 0=No connection to network
LINK_2	1	Ethernet 2 link status, 1=Network connected (Link), 0=No connection to network
RESERVED	2-3	Unused bits should be set to 0
CTRL_PRESENT	4	1=Controller present on network, 0=No controller present on network
AD_DATA_FAIL	5	1=AD data encoding violation, 0=No violation.
NO_INPUT_SOURCE	6	1=No input source available in any of the input routers, 0=Both have input
RESERVED	7	Unused bits should be set to 0
CLOCK_SLIP_AES_1	8	1=AES1 clock slipping, 0=Clock ok
CLOCK_SLIP_AES_2	9	1=AES2 clock slipping, 0=Clock ok
CLOCK_SLIP_DANTE	10	1=DANTE clock slipping, 0=Clock ok
PROT_MUTE_STATE	11	1=Muted by GPI protection mute state, 0=Normal operation
DANTE_MASTER	12	1=Unit is DANTE clock master, 0=Slave
FAN_ALARM	13	1=Fan is broken, 0=Normal operation
TEMP_WARNING	14	1=Temperature warning, 0=Temperature is below threshold
OVERTEMP	15	1=Temperature is too high, 0=Temperature is below threshold
RESERVED	16-31	Unused bits should be set to 0

10 FAQ

1. Question:
A Source ID for the sender is mentioned. Is this something we generate ourselves? I.e. we'll have our control system talking to the units, so does this mean we generate a unique 64 bit ID for it ourselves? It also mentions the ID being incremented each time, does this mean we have to start every message we send with a new ID number?
Answer:
You have to generate the source ID yourself and it can be any random number. Once generated it can remain the same for the whole session. Just remember to increase the value of the message ID (the last field in the packet header) by one for each message you send so that each message gets a unique ID.

2. Question:
Source and Destination Class, use 6 and 5 or 0 respectively. Is the system looking for literally (06) and (05)/(00), or does it need the Hex representation of the Ascii code for these numbers? (36) and (35)/(30) respectively.
Answer:
You must enter them literally, i.e. use (06) and (05)/(00).

3. Question:
The Documentation mentions the Packet Footer being a reserved 4byte value, but doesn't seem to mention what that reserved value is.
Answer:
The packet footer is unused for the DLM message type (packet type 701) so it doesn't matter what you enter into this field. You could set it to zero if you like.

4. Question:
Are we working with 2 separate UDP ports, 6004 for receiving, and 6015 for transmitting?
Answer:
The PLM and LM26 will send messages to port 6004 so you must use this port for the receiving socket.
The transmitting socket can use any port but you must send the messages to port 6015 since this is the port that the PLM listens to.
Also, please have a look at appendix C in the DLM control protocol documentation for an example application written in C code.

5. Question:
Is there any reason for the value of 120 instead of 528 for the payload size? Presumably this just reflects the maximum payload size of actual messages used within this particular application?
Answer:
Correct, 120 is the maximum payload for current messages. 560 is the maximum size for the whole packet.

6. Question:
It is not stated in the protocol doc but it looks from the test code that the payload size should always be a multiple of 4 bytes (see macro (DLM_ALIGN_SIZE)), is this correct?
Answer:

No, you don't need to align the size. The unit will align the response e.g. "Dev.Power?" will have sLength set to 36 instead of 33 (footer + header = 32).

7. Question:
Msg_Ack result code values, the test code has some different result codes defined (-7 to -21) and doesn't have the ones listed in the document (-3 to -6). What is the definitive result code list?
Answer:
Suggest that you only check for ACK_SUCCESS (-2L), all the others are more or less internal error codes i.e. can be good for us to know if you have a specific problem. If something fails you send the command again.

8. Question:
Is there a document I can read that explains the gain structure of a PLM?
Answer:
Yes, please see section "Signal Flow and Lake Processing" in;
For PLM: PLM Series Operation Manual
For LM26: LM26 Operation Manual

9. Question:
When using the Dev.Preset.Recall, is there any way to interrogate the PLM to determine what preset is currently active?
Answer:
No, the PLM and LM don't know which frame preset that is active. But, if the frame Label is used i.e. with different frame labels for different presets, then this can be used to determine which preset that currently is active.

10.Question:
Is the current preset remembered after a PLM power cycle?
Answer:
Yes, all parameters are remembered. The PLM does however not remember what preset number currently is active.

11.Question:
Is there any problem in repeatedly sending the Dev.Preset.Recall command with the same preset value, i.e. would this result in any audible artifacts?
Answer:
Yes, the audio is muted during a preset recall since all the DSP parameters is set. This will have audio muted during about 1 second. And since the PLM doesn't know which preset that is active, it will do this for every time the command is received.

12.Question:
When sending to a specific PLM unit I presume that the Destination Class should be set to 5 for both Unicast and Broadcast cases?
Answer:
Yes.

13.Question:
When sending to all PLM units I presume that the Destination ID is 'don't care' as implied by section 4.1.2 ("the application doesn't need to set this").
Answer:
Yes.

14.Question:

I have done a DLM implementation using the 3rd party protocol for PLM Series version 1 with PLM Series firmware 2.69. Can I still use my 3rd party control module if I update to PLM Series firmware 2.75?

Answer:

Yes, all commands for version 1 are still valid with firmware 2.75, and it will answer in the same way as before. If version 2 is wanted, the command needs to be extended to also include a "2" to actively choose that it is the extended version 2 that is wanted.

15. Question:

Can I monitor PSU Mains input with my PLM 10000Q or 14000 via DLM?

Answer:

No, PSU Mains input is only available on the PLM 20000Q with firmware above 2.74.

16. Question:

I want to send a single broadcast UDP command to all online units, and I don't care about getting an ack.

Answer:

There is an example of this in the example code section, "Transmit heartbeat", where the header can be re-used except for packet length and type.

17. Question:

I can't get the communication to work, and I have double checked my commands and everything is in order.

Answer:

Confirm that you are on the same subnet with your Controller as the devices you are trying to control.

11 Appendix C: Example application source code

This application allows you to send any of the command strings (from 8.1.1) to a single PLM using unicast (you can also use broadcast by replacing SENDUDP_UNICAST with SENDUDP_BROADCAST). The application takes three arguments; adapter IP (on the host machine), unique 64bits ID and the message. For example, to set the frame label you need to type this on the command line:
>dlmTest 10.10.10.116 3d000011:d6ed9201 "Dev.FrameLabel=testName"

We can also fetch the frame label by typing:
>dlmTest 10.10.10.116 3d000011:d6ed9201 "Dev.FrameLabel?"

```
/*============================================================================
  Console application for sending DLM protocol messages to a single unit.
============================================================================*/

#include <windows.h>
#include <stdio.h>

/*============================================================================
Various defs and structures
============================================================================*/
#define SENDUDP_BROADCAST    true   // Use this in order to send broadcast
#define SENDUDP_UNICAST      false  // Use this in order to send unicast
#define RESPTYPE_NORESP      -1     // Ignore response

typedef struct in_addr   MYINADDR;
typedef struct in_addr *PMYINADDR;

#define MAX_NETWORKBINDING_DESCR   128
struct Network_Binding
{
    // A user-friendly description of the connection
    char szDescription[MAX_NETWORKBINDING_DESCR];

    // IP address of the connection. If 0, then this connection is
    // currently not connected (eg: network cable unplugged).
    unsigned long ulIpAddr;
};
typedef struct Network_Binding   NETWORKBINDING;
typedef struct Network_Binding *PNETWORKBINDING;

#define MAX_NETWORKBINDING 10
struct Network_Info
{
    unsigned int nBindingsFound;
    NETWORKBINDING Network_Bindings[MAX_NETWORKBINDING];
};
typedef struct Network_Info   NETWORKINFO;
typedef struct Network_Info *PNETWORKINFO;

/*============================================================================
Structures and definitions describing PLM messages.
A PLM message comprises, in order: header + payload + footer
============================================================================*/
#define BROADCAST_CLASSID    0
#define PLM_CLASSID          5
#define HOST_CLASSID         6

#define TYPE1_CLASS_MASK 0x8000
#define TYPE2_CLASS_MASK 0x4000
```

```
#define TYPE3_CLASS_MASK 0x2000
#define ALL_CLASS_MASK (TYPE1_CLASS_MASK | TYPE2_CLASS_MASK | TYPE3_CLASS_MASK)

#define BRDCAST_PRODUCT_PLM10000Q      0x4
#define BRDCAST_PRODUCT_PLM14000       0x6
#define BRDCAST_PRODUCT_PLM20000Q      0x9
#define BRDCAST_PRODUCT_LM26           0xa
#define BRDCAST_PRODUCT_LM26MESA       0xb
#define BRDCAST_PRODUCT_LM44           0xc
#define BRDCAST_PRODUCT_LM44MESA       0xd
#define BRDCAST_PRODUCT_PLM12K44       0x13
#define BRDCAST_PRODUCT_PLM20K44       0x14
#define BRDCAST_PRODUCT_DSERIES_8K44   0x15
#define BRDCAST_PRODUCT_DSERIES_12K44  0x16
#define BRDCAST_PRODUCT_DSERIES_20K44  0x17

#define MAX_MESSAGE_SIZE_CHAR (140 * 4)

#define BROADCAST_IDHI      -2
#define BROADCAST_IDLO      -3

#define HOST_PORT_RCV 6004 // DLM Host listens on this port
#define HOST_PORT_SND 6015 // DLM Host sends on this port. Other ports can be used
#define DLM_PORT_RCV  6015 // DLM Unit listens on this port

/* Message Header */
struct MSG_CmdHdr
{
    long lSrcIDHi;    // Hi 32 bits of the unique 64-bit source ID
    long lSrcIDLo;    // Lo 32 bits of the unique 64-bit source ID
    long lDestIDHi;      // Hi 32 bits of the unique 64-bit dest ID
    long lDestIDLo;      // Lo 32 bits of the unique 64-bit dest ID
    short sSrcClass;  // Source class ID
    short sDestClass; // Dest class ID
    short sLength;    // Total msg length, in bytes, incl. header, payload and footer
    short sType;      // Msg type
    long lMsgID;      // Message ID
};
typedef struct MSG_CmdHdr MSGCMDHDR;
typedef struct MSG_CmdHdr *PMSGCMDHDR;

/* Message Footer */
struct MSG_CmdFtr
{
    long    lChecksum;
};
typedef struct MSG_CmdFtr MSGCMDFTR;
typedef struct MSG_CmdFtr *PMSGCMDFTR;

/* Msg types */
#define Msg_Ack                 2
#define Msg_BroadcastID         4
#define Msg_MultiBroadcastID    5
#define Msg_DLMMsg              701

/* Ack response codes */
#define ACK_SUCCESS      -2  /* Success */

/* DLM msg payload size (bytes) */
#define MAX_DLMPROTO_PAYLOAD_LEN  120

/* DLM pkt alignment */
```

```
#define DLM_PKT_ALIGNMENT    4
#define DLM_ALIGN_SIZE(sz)   ((sz + (DLM_PKT_ALIGNMENT-1)) & (~(DLM_PKT_ALIGNMENT-1)))

/* Ack response */
struct MSG_Ack
{
    MSGCMDHDR hdr;
    long lResult;
    MSGCMDFTR ftr;
};
typedef struct MSG_Ack MSGACK;
typedef struct MSG_Ack *PMSGACK;

/* DLM unit BroadcastID msg */
struct MSG_BroadcastID {
    MSGCMDHDR hdr;
    long lPad1[9];
    long lFlags[4];
    long lPad2[4];
    MSGCMDFTR ftr;
};
typedef struct MSG_BroadcastID MSGBROADCASTID;
typedef struct MSG_BroadcastID *PMSGBROADCASTID;

/* DLM unit MultiBroadcastID msg */
struct MSG_MultiBroadcastID {
    MSGCMDHDR hdr;
    short sBroadcasts;
    MSGBROADCASTID Multi[4];
    MSGCMDFTR ftr;
};
typedef struct MSG_MultiBroadcastID MSGMULTIBROADCASTID;
typedef struct MSG_MultiBroadcastID *PMSGMULTIBROADCASTID;

/* DLM message */
struct MSG_DLMMsg
{
    MSGCMDHDR hdr;
    char        szMsg[DLM_ALIGN_SIZE(MAX_DLMPROTO_PAYLOAD_LEN)];
    MSGCMDFTR ftr;
};
typedef struct MSG_DLMMsg MSGDLMMSG;
typedef struct MSG_DLMMsg *PMSGDLMMSG;

/*============================================================================
Structure describing a networked DLM unit
============================================================================*/
#define MAXSZFRAMENAME 16
struct Dlm_Unit
{
    short         ClassId;
    long          IdHi;
    long          IdLo;
    char          Name[MAXSZFRAMENAME];
    unsigned long IP;
};
typedef struct Dlm_Unit   DLMUNIT;
typedef struct Dlm_Unit *PDLMUNIT;

/*============================================================================
Function prototypes
============================================================================*/
```

```
void fillHeader(PMSGCMDHDR pHdr, short sLength, short sType, bool bBroadcast);
long lGenerateChecksum(PMSGCMDHDR pMsg);

/*============================================================================
Global data
============================================================================*/
SOCKET TranSocket;       // Transmit DLM msgs on this socket
SOCKET RecvSocket;       // Receive  DLM msgs on this socket
DLMUNIT gDlmUnit;    // The unit we are trying to address
unsigned long HostIP;// IP of the DLM host
long HostIdHi;       // High 32-bit of 64-bit host ID
long HostIdLo;       // Lo   32-bit of 64-bit host ID
long HostMsgId;          // Unique ID for every transmitted msg

// Info about the various network connections available on the host machine.
NETWORKINFO MyNetworkInfo;

// Buffer for received UDP datagrams
char rxUdp[MAX_MESSAGE_SIZE_CHAR];

/*============================================================================
Initialise the 64-bit host ID using the system time (to make it unique). This could
actually be any number but since this application exits after one command 'HostMsgId'
won't be increased correctly (if we run it more than once).
============================================================================*/
void GetHostID(void)
{
    if ((HostIdHi != 0) && (HostIdLo != 0))    {return;}

    SYSTEMTIME CurrentTime;
    GetLocalTime(&CurrentTime);
    FILETIME CurrentFileTime;
    SystemTimeToFileTime(&CurrentTime, &CurrentFileTime);
    HostIdHi = CurrentFileTime.dwHighDateTime;
    HostIdLo = CurrentFileTime.dwLowDateTime;

    return;
}

/*============================================================================
Session initialisation.
============================================================================*/
void DlmTestInit(void)
{
    TranSocket = INVALID_SOCKET;
    RecvSocket = INVALID_SOCKET;

    memset(&gDlmUnit, 0, sizeof(gDlmUnit));
    memset(&MyNetworkInfo, 0, sizeof(NETWORKINFO));

    HostIP    = inet_addr("0.0.0.0");
    HostIdHi  = 0;
    HostIdLo  = 0;
    HostMsgId = 1;

    GetHostID();
}

/*============================================================================
Generate DLM msg checksum
============================================================================*/
long lGenerateChecksum(PMSGCMDHDR pMsg)
```

```
{
    int i;
    unsigned long lCheckSum = 0L;
    for(i=0;i< (int)((pMsg->sLength >> 1)-sizeof(unsigned short)); i++) {
       lCheckSum = (lCheckSum<<1) | ( ((lCheckSum>>31)&1) ^ ((lCheckSum>>18)&1) );
        lCheckSum ^= (unsigned long)(((unsigned short *)(pMsg))[i]);
    }

    return((long)lCheckSum);
}

/*============================================================================
Read a DLM msg from the UDP port. Returns TRUE if it's a properly-formed DLM msg
whose 64-bit ID either matches the host ID or is the special 'broadcast' ID.
============================================================================*/
bool bReadUDP(char *RxMsg, unsigned long nBytesMax, unsigned long *nBytes, PMYINADDR
pIpRx)
{
    SOCKADDR_IN sa;
    int nSize = sizeof(SOCKADDR_IN);
    PMSGCMDHDR pHdr;

    int nBytesRcvd = recvfrom(   RecvSocket,
                            RxMsg,
                            nBytesMax,
                            0,
                            (SOCKADDR FAR *)&sa,
                            &nSize);

    if (    nBytesRcvd == SOCKET_ERROR
        || nBytesRcvd < sizeof(MSGCMDHDR)
        || sa.sin_addr.s_addr == HostIP )   // Ignore anything from the host address
    {
        goto bReadUDP_Error;
    }

    pHdr = (PMSGCMDHDR) RxMsg;


    if (  (pHdr->lSrcIDHi == HostIdHi  &&  pHdr->lSrcIDLo == HostIdLo) // Ignore
anything from host
        || pHdr->sLength <= sizeof(MSGCMDHDR)
        || pHdr->sLength > MAX_MESSAGE_SIZE_CHAR
        || pHdr->sLength != nBytesRcvd )
    {
        goto bReadUDP_Error;
    }

    if ( !(   (pHdr->lDestIDHi == BROADCAST_IDHI  &&  pHdr->lDestIDLo ==
BROADCAST_IDLO)
          || (pHdr->lDestIDHi == HostIdHi        &&  pHdr->lDestIDLo ==
HostIdLo      ))
       )
    {
        goto bReadUDP_Error;
    }

    *nBytes = (unsigned long)nBytesRcvd;
    if(pIpRx)  {*pIpRx = sa.sin_addr;}
    return true;

bReadUDP_Error:
```

```
    *nBytes = 0;
    return false;
}

/*============================================================================
Write a DLM msg to the UDP port. Returns true on success otherwise false.
============================================================================*/
bool bWriteUDP(char *TxMsg, unsigned long nBytes, bool bBroadcast)
{
    if (nBytes > MAX_MESSAGE_SIZE_CHAR)
    {
        printf("Length of packet too long\n");
        return false;
    }

    SOCKADDR_IN sa;
    sa.sin_family = AF_INET;
    sa.sin_port   = htons(DLM_PORT_RCV);

    if (bBroadcast)
        sa.sin_addr.s_addr = htonl(INADDR_BROADCAST);
    else
        sa.sin_addr.s_addr = gDlmUnit.IP;

    int nBytesSent = sendto(TranSocket,
                        (const char *)TxMsg,
                        nBytes,
                        0,
                        (SOCKADDR *)&sa,
                        sizeof(SOCKADDR_IN));

    if (nBytesSent == SOCKET_ERROR  ||  nBytesSent < (int)nBytes)
    {
        printf("Error from sendto\n");
        return false;
    }

    return true;
}


/*============================================================================
Close sockets
============================================================================*/
void CloseUDP(void)
{
    if(TranSocket != INVALID_SOCKET)    {closesocket(TranSocket);}
    TranSocket = INVALID_SOCKET;
    if(RecvSocket != INVALID_SOCKET)    {closesocket(RecvSocket);}
    RecvSocket = INVALID_SOCKET;
}

/*============================================================================
Flush receive socket
============================================================================*/
void FlushUDP(void)
{
    unsigned long DataSize=1;
    SOCKADDR_IN sa;
    int nSize = sizeof(SOCKADDR_IN);
```

```
    while (DataSize)
    {
        ioctlsocket(RecvSocket, FIONREAD, &DataSize);
        if (DataSize)
        {
            recvfrom(   RecvSocket
                       ,rxUdp
                       ,MAX_MESSAGE_SIZE_CHAR
                       ,0
                       ,(SOCKADDR FAR *)&sa
                       ,&nSize);
        }
    }
}

/*============================================================================
Check if data available on receive socket
============================================================================*/
unsigned long IsRcvRdy(void)
{
    unsigned long DataSize=1;
    ioctlsocket(RecvSocket,FIONREAD,&DataSize);
    return DataSize;
}

/*============================================================================
Fill DLM msg header
============================================================================*/
void fillHeader(PMSGCMDHDR pHdr, short sLength, short sType, bool bBroadcast)
{
    pHdr->lDestIDHi  = bBroadcast ? 0x12345678 : gDlmUnit.IdHi; // Not used for
broadcast
    pHdr->lDestIDLo  = bBroadcast ? 0x9abcdef0 : gDlmUnit.IdLo; // Not used for
broadcast
    pHdr->lSrcIDHi   = HostIdHi;
    pHdr->lSrcIDLo   = HostIdLo;
    pHdr->sDestClass = bBroadcast ? BROADCAST_CLASSID : gDlmUnit.ClassId;
    pHdr->sSrcClass  = HOST_CLASSID;
    pHdr->sLength    = sLength;
    pHdr->sType      = sType;
    // Hosts must increment msg ID with each new msg sent to a particular unit.
    // It's OK to use the same msg ID when sending the same payload to multiple units.
    // For this application we actually don't need to do this since we have a unique
source id.
    pHdr->lMsgID     = HostMsgId++;
}

/*============================================================================
Send a DLM msg and look for a response of the specified type. If the response is
found it returns a pointer to the response otherwise NULL.
============================================================================*/
PMSGCMDHDR sendDlmMsg(PMSGCMDHDR TxMsg, short respType, bool bBroadcast, bool
bAllowAck)
{
    const int nSendRetries = 3;
    const int nReceiveRetries = 10;

    if (respType < 0)
    {
        FlushUDP();
        bWriteUDP((char *)TxMsg, TxMsg->sLength, bBroadcast);
        return NULL;
```

```
    }

    for (int s = 0; s < nSendRetries; s++)
    {
        FlushUDP();
        if (!bWriteUDP((char *)TxMsg, TxMsg->sLength, bBroadcast))
        {
            Sleep(100);
            continue;
        }

        for (int r = 0; r < nReceiveRetries; r++)
        {
            unsigned long nBytesRx = 0;
            if ( IsRcvRdy()  &&  bReadUDP(rxUdp, MAX_MESSAGE_SIZE_CHAR, &nBytesRx,
NULL) )
            {
                PMSGCMDHDR RxMsg = (PMSGCMDHDR) rxUdp;
                if (   RxMsg->lMsgID == TxMsg->lMsgID
                    && (RxMsg->sType  == respType  ||  (RxMsg->sType == Msg_Ack &&
bAllowAck))
                    /* Ignore heartbeat and meter broadcasts from the units. */
                    && !( (RxMsg->lDestIDHi == BROADCAST_IDHI)  &&  (RxMsg->lDestIDLo ==
BROADCAST_IDLO) ) )
                {
                    return RxMsg;
                }
            }

            Sleep(100);
        }
    }

    return NULL;
}

/*============================================================================
Broadcasts a heartbeat message on the network to signal the presence of a host.
============================================================================*/
void TransmitHeartbeat(void)
{
    // Setup the header of the packet
    MSGBROADCASTID message;
    memset(&message, 0, (sizeof(message)));

    message.hdr.lDestIDHi = BROADCAST_IDHI;       // Message destination is all devices
on the network
    message.hdr.lDestIDLo = BROADCAST_IDLO;
    message.hdr.lSrcIDHi = HostIdHi;          // Dummy ID of the sender
    message.hdr.lSrcIDLo = HostIdLo;
    message.hdr.sSrcClass = HOST_CLASSID;     // Packet sent from a Host
    message.hdr.sDestClass = BROADCAST_CLASSID;   // Packet sent to all device types
    message.hdr.sType = Msg_BroadcastID;          // Broadcast ID Msg packet
    message.hdr.sLength = sizeof(message);        // Size of packet in bytes
    message.hdr.lMsgID = HostMsgId++;
    message.ftr.lChecksum = lGenerateChecksum(&message.hdr); // Calculate checksum

    // Send message
    sendDlmMsg( (PMSGCMDHDR)&message, RESPTYPE_NORESP, SENDUDP_BROADCAST, FALSE);
}

/*============================================================================
```

```
Listen on the network for DLM units (heartbeat) and look for the unique 64-bit ID.
Returns true if the unit is found, false otherwise.
==========================================================================*/
bool bFindDlmUnit(const char* szFrameId)
{
    if (HostIP == inet_addr("0.0.0.0")  ||  TranSocket == INVALID_SOCKET  ||
RecvSocket == INVALID_SOCKET)
        return false;

    FlushUDP(); // Flush all buffered data since we last scanned the receive socket

    /* Transmit a heartbeat. All units that receive a heartbeat will start transmitting
heartbeats for 10s. */
    TransmitHeartbeat();

    for(int i = 0; i < 300; i++)
    {
        unsigned long nBytes=0;
        MYINADDR unitaddr;

        Sleep(5);

        if (IsRcvRdy() && bReadUDP(rxUdp, MAX_MESSAGE_SIZE_CHAR, &nBytes, &unitaddr))
        {
            PMSGCMDHDR pHeader = (PMSGCMDHDR)rxUdp;

            if ((pHeader->sSrcClass & (short)~ALL_CLASS_MASK) == PLM_CLASSID)
            {
                long lProductFlags = 0;

                if (pHeader->sType == Msg_BroadcastID)
                {
                    PMSGBROADCASTID pBcastId = (PMSGBROADCASTID)pHeader;
                    lProductFlags = pBcastId->lFlags[2];
                }
                else if (pHeader->sType == Msg_MultiBroadcastID)
                {
                    PMSGMULTIBROADCASTID pMultiBcastId = (PMSGMULTIBROADCASTID)pHeader;
                    lProductFlags = pMultiBcastId->Multi[0].lFlags[2];
                }
                else
                {
                    continue;
                }

                switch (lProductFlags)
                {
                case BRDCAST_PRODUCT_PLM10000Q:
                case BRDCAST_PRODUCT_PLM14000:
                case BRDCAST_PRODUCT_PLM20000Q:
                case BRDCAST_PRODUCT_LM26:
                case BRDCAST_PRODUCT_LM26MESA:
                case BRDCAST_PRODUCT_LM44:
                case BRDCAST_PRODUCT_LM44MESA:
                case BRDCAST_PRODUCT_PLM12K44:
                case BRDCAST_PRODUCT_PLM20K44:
                case BRDCAST_PRODUCT_DSERIES_8K44:
                case BRDCAST_PRODUCT_DSERIES_12K44:
                case BRDCAST_PRODUCT_DSERIES_20K44:
                    {
                        char buf[32];
                        sprintf(buf, "%x:%x", pHeader->lSrcIDHi, pHeader->lSrcIDLo);
```

```
                        if (strcmp(buf, szFrameId) == 0)
                        {
                            // Correct unit found
                            gDlmUnit.ClassId = pHeader->sSrcClass & ~ALL_CLASS_MASK;
                            gDlmUnit.IdHi    = pHeader->lSrcIDHi;
                            gDlmUnit.IdLo    = pHeader->lSrcIDLo;
                            gDlmUnit.IP      = unitaddr.s_addr;

                            struct in_addr UnitAddr;
                            UnitAddr.s_addr = gDlmUnit.IP;
                            printf("Found %08x:%08x (IP = %s)\n", gDlmUnit.IdHi,
gDlmUnit.IdLo, inet_ntoa(UnitAddr));
                            return true;
                        }
                    }
                    break;

                default:
                    // Not supported
                    break;
                }
            }
        }
    }

    printf("%s was not found on the network!\n", szFrameId);
    return false;
}

/*============================================================================
Initialise UDP transport
============================================================================*/
bool InitialiseSockets(void)
{
    CloseUDP();

    /* Check for WinSock 2.2. Later versions may also work. */
    WORD wVersionRequested = 0x0202;
    WSADATA wsaData;
    int err;

    err = WSAStartup( wVersionRequested, &wsaData );
    if ( err != 0 )
    {
        printf("Error from WSAStarup - Check TCP/IP Installation\n");
        return false;
    }

    if (   LOBYTE( wsaData.wVersion ) != 2
        || HIBYTE( wsaData.wVersion ) != 2 )
    {
        printf("Windows Sockets DLL does not support 2.2\n");
        return false;
    }

    TranSocket = socket(AF_INET, SOCK_DGRAM, IPPROTO_UDP);
    RecvSocket = socket(AF_INET, SOCK_DGRAM, IPPROTO_UDP);
    if (INVALID_SOCKET == TranSocket  ||  INVALID_SOCKET == RecvSocket)
    {
        CloseUDP();
        printf("Unable to create socket\n");
        return false;
```

```
    }

    SOCKET MySocks[2];
    MySocks[0] = TranSocket;
    MySocks[1] = RecvSocket;
    BOOL bReuseAddr = TRUE;
    BOOL bBroadcast = TRUE;
    SOCKADDR_IN sa;

    for (int i=0; i<2; i++)
    {
        if (setsockopt
                (MySocks[i]
                ,SOL_SOCKET
                ,SO_REUSEADDR
                ,(const char*) &bReuseAddr
                ,sizeof(bReuseAddr)
                )
           )
        {
            CloseUDP();
            printf("setsockopt error\n");
            return false;
        }

        if (setsockopt
                (MySocks[i]
                ,SOL_SOCKET
                ,SO_BROADCAST
                ,(const char*) &bBroadcast
                ,sizeof(bBroadcast)
                )
           )
        {
            CloseUDP();
            printf("setsockopt error\n");
            return false;
        }

        sa.sin_family      = AF_INET;
        sa.sin_addr.s_addr = HostIP;
        if(MySocks[i] == TranSocket){sa.sin_port = htons(HOST_PORT_SND);}
        else                        {sa.sin_port = htons(HOST_PORT_RCV);}

        if ( bind(MySocks[i], (struct sockaddr*) &sa, sizeof(sa)) )
        {
            CloseUDP();
            printf("Bind error\n");
            return false;
        }
    }
    return true;
}

/*=============================================================================
Select connection on host machine
=============================================================================*/
bool bSetNetworkBinding(unsigned int nBinding, char *szIP)
{
    if ( !szIP && nBinding >= MyNetworkInfo.nBindingsFound )
    {
        return false;
```

```
    }

    if (!szIP) { HostIP = MyNetworkInfo.Network_Bindings[nBinding].ulIpAddr; }
    else       { HostIP = inet_addr(szIP); }

    if (HostIP == INADDR_NONE )
    {
        HostIP = inet_addr("0.0.0.0");
        return false;
    }

    /* Initialise the UDP transport */
    CloseUDP();
    int nRetry = 5;
    while (--nRetry > 0)
    {
        if (InitialiseSockets()) {break;}
        Sleep(250);
    }
    if (nRetry == 0)
    {
        CloseUDP();
        HostIP = inet_addr("0.0.0.0");
        return false;
    }
    FlushUDP();
    return true;
}

/*============================================================================
Send a DLM msg to the specified unit. Returns true if a successful response
otherwise false.
============================================================================*/
bool bHandleDlmMsg(char *szMsg)
{
    MSGDLMMSG DlmCmd;
    PMSGDLMMSG pDlmCmdRx;

    /* Construct the payload */
    memset(DlmCmd.szMsg, 0, DLM_ALIGN_SIZE(MAX_DLMPROTO_PAYLOAD_LEN));
    strncpy(DlmCmd.szMsg, szMsg, DLM_ALIGN_SIZE(MAX_DLMPROTO_PAYLOAD_LEN) - 1);

    printf("DLM msg is \"%s\"\n\n", DlmCmd.szMsg);

    /* Must fill header each time a new unit is selected in
       order to pick up the correct 64-bit destination ID */
    fillHeader(&(DlmCmd.hdr), sizeof(MSGDLMMSG), Msg_DLMMsg, SENDUDP_UNICAST);

    /* Set checksum to zero for DLMMsg commands. */
    DlmCmd.ftr.lChecksum = 0;

    /* Send the msg */
    pDlmCmdRx = (PMSGDLMMSG) sendDlmMsg( (PMSGCMDHDR)&DlmCmd, Msg_DLMMsg,
SENDUDP_UNICAST, true);

    /* Print status */
    if (pDlmCmdRx)
    {
        if (pDlmCmdRx->hdr.sType == Msg_DLMMsg)
            printf("%08x:%08x returned \"%s\"\n", gDlmUnit.IdHi, gDlmUnit.IdLo,
pDlmCmdRx->szMsg);
        else if (pDlmCmdRx->hdr.sType == Msg_Ack)
```

```
        {
            long lResult = ((PMSGACK)pDlmCmdRx)->lResult;
            if (lResult == ACK_SUCCESS)
                printf("%08x:%08x command succeeded\n", gDlmUnit.IdHi, gDlmUnit.IdLo);
            else
            {
                printf("%08x:%08x returned unsuccessful Ack (%i)\n", gDlmUnit.IdHi,
gDlmUnit.IdLo, lResult);
                return false;
            }
        }

        return true;
    }
    else
    {
        printf("%08x:%08x did not respond\n", gDlmUnit.IdHi, gDlmUnit.IdLo);
        return false;
    }
}

/*============================================================================
The application takes 3 input parameters: adapter IP, unique 64bits ID and the message
Here is an example (dlmTest is the name of the compiled .exe):
>dlmTest 10.10.10.116 3d000011:d6ed9201 "Dev.Power?"
============================================================================*/
int main(int argc, char* argv[])
{
    DlmTestInit();

    int nResult = 0;
    if (argc != 4 || !bSetNetworkBinding(0, argv[1]) || !bFindDlmUnit(argv[2])
|| !bHandleDlmMsg(argv[3]))
        nResult = -1;

    CloseUDP();
    return nResult;
}
```

12 Appendix D: Example application HEX strings

12.1 Broadcast to all PLM and LM units with no ack needed

12.1.1 Power ON

This is a short example of HEX string, where we want to put all units on the network to ON without a need for ack (confirmation).

#	Field	Name	Size	Comment	Example Hex (\x…)
1	lSrcIDHi	Source ID	4 Bytes	ID of the Controller	\x00\x00\x00\x00
2	LSrcIDLo	Source ID	4 Bytes		\x01\x00\x00\x00
3	lDestIDHi	Destination ID	4 Bytes	According to Destination ID this is BROADCAST	\xFE\xFF\xFF\xFF
4	lDestIDLo	Destination ID	4 Bytes		\xFD\xFF\xFF\xFF
5	sSrcClass	Source Class	2 Bytes	Indicating host	\x06\x00
6	sDestClass	Destination Class	2 Bytes	Broadcast	\x00\x00
7	sLength	Length	2 Bytes	The total sum of Bytes is 44 that equals 0x2C	\x2C\x00
8	sPacketType	Packet Type	2 Bytes	Indicating this is a DLM message	\xBD\x02
9	lMsgID	Message ID	4 Bytes	No ack will be sent from the receiver	\xFF\xFF\xFF\xFF
10	Message / Payload		12Bytes	This is the HEX message for Dev.Power=1	\x44\x65\x76\x2E\x50\x6F\x77\x65\x72\x3D\x31\x00
11	Footer		4 Bytes	Reserved 4 bytes of zero	\x00\x00\x00\x00
	Total		∑44 Bytes	Total sum of bytes that must be calculated to be used in field 7 above.	

12.1.2 Hex string to send (\x Hex identifier)

\x00\x00\x00\x00\x01\x00\x00\x00\xFE\xFF\xFF\xFF\xFD\xFF\xFF\xFF\x06\x00\x00\x00\x2C\x00\xBD\x02\xFF\xFF\xFF\xFF\x44\x65\x76\x2E\x50\x6F\x77\x65\x72\x3D\x31\x00\x00\x00\x00\x00

12.1.3 Power OFF

This is a short example of HEX string, where we want to put all units on the network to Standby without a need for ack (confirmation).

#	Field	Name	Size	Comment	Example Hex (\x…)
1	lSrcIDHi	Source ID	4 Bytes	ID of the Controller	\x00\x00\x00\x00
2	LSrcIDLo	Source ID	4 Bytes		\x01\x00\x00\x00
3	lDestIDHi	Destination ID	4 Bytes	According to Destination ID this is BROADCAST	\xFE\xFF\xFF\xFF
4	lDestIDLo	Destination ID	4 Bytes		\xFD\xFF\xFF\xFF
5	sSrcClass	Source Class	2 Bytes	Indicating host	\x06\x00
6	sDestClass	Destination Class	2 Bytes	Broadcast	\x00\x00
7	sLength	Length	2 Bytes	The total sum of Bytes is 44 that equals 0x2C	\x2C\x00
8	sPacketType	Packet Type	2 Bytes	Indicating this is a DLM message	\xBD\x02
9	lMsgID	Message ID	4 Bytes	No ack will be sent from the receiver	\xFF\xFF\xFF\xFF
10	Message / Payload		12Bytes	This is the HEX message for "Dev.Power=0"	\x44\x65\x76\x2E\x50\x6F\x77\x65\x72\x3D\x30\x00
11	Footer		4 Bytes	Reserved 4 bytes of zero	\x00\x00\x00\x00
	Total		∑44 Bytes	Total sum of bytes that must be calculated to be used in field 7 above.	

12.1.4 Hex string to send (\x Hex identifier)

\x00\x00\x00\x00\x01\x00\x00\x00\xFE\xFF\xFF\xFF\xFD\xFF\xFF\xFF\x06\x00\x00\x00\x2C\x00\xBD\x02\xFF\xFF\xFF\xFF\x44\x65\x76\x2E\x50\x6F\x77\x65\x72\x3D\x31\x00\x00\x00\x00\x00

12.1.5 Preset Recall (preset 1 in this example)

This is a short example of HEX string, for an example where we want to put all units on the network to standby without a need for ack (confirmation).

#	Field	Name	Size	Comment	Example Hex (\x…)
1	lSrcIDHi	Source ID	4 Bytes	ID of the Controller	\x00\x00\x00\x00 \x01\x00\x00\x00
2	LSrcIDLo	Source ID	4 Bytes		
3	lDestIDHi	Destination ID	4 Bytes	According to Destination ID this is BROADCAST	\xFE\xFF\xFF\xFF \xFD\xFF\xFF\xFF
4	lDestIDLo	Destination ID	4 Bytes		
5	sSrcClass	Source Class	2 Bytes	Indicating host	\x06\x00
6	sDestClass	Destination Class	2 Bytes	Broadcast	\x00\x00
7	sLength	Length	2 Bytes	The total sum of Bytes is 43 that equals 0x2B	\x34\x00
8	sPacketType	Packet Type	2 Bytes	Indicating this is a DLM message	\xBD\x02
9	lMsgID	Message ID	4 Bytes	No ack will be sent from the reciver	\xFF\xFF\xFF\xFF
10	Message / Payload		20 Bytes	This is the HEX message for "Dev.Preset.Recall!1"	\x44\x65\x76\x2E\x50\x72\x65\x73\x65\x74\x2E \x52\x65\x63\x61\x6C\x6C\x21\x31\x00
11	Footer		4 Bytes	Reserved 4 bytes of zero	\x00\x00\x00\x00
	Total		∑52 Bytes	Total sum of bytes that must be calculated to be used in field 7 above.	

12.1.6 Hex string to send (\x Hex identifier)

\x00\x00\x00\x00\x01\x00\x00\x00\xFE\xFF\xFF\xFF\xFD\xFF\xFF\xFF\x06\x00\x00\x00\x34\x00\xBD\x02\xFF\xFF\xFF\xFF\x44\x65\x76\x2E\x50\x72\x65\x73\x65\x74\x2E\x52\x65\x63\x61\x6C\x6C\x21\x31\x00\x00\x00\x00\x00

12.1.7 Mod.In.Mute (with additional information)

This is one extended guide on how the protocol works. When a DLM message is sent, field **7** and **10** needs to be customized for that particular DLM command. For example, if there is a need to control the Module Input mute on all A modules on the network, the command is "Mod.In.Mute=A 1". This will mute all A modules on the network.

#	Field	Name	Size	Comment	Example Hex (\x…)
1	lSrcIDHi	Source ID	4 Bytes	ID of the Controller	\x00\x00\x00\x00
2	LSrcIDLo	Source ID	4 Bytes		\x01\x00\x00\x00
3	lDestIDHi	Destination ID	4 Bytes	According to Destination ID this is BROADCAST	\xFE\xFF\xFF\xFF
4	lDestIDLo	Destination ID	4 Bytes		\xFD\xFF\xFF\xFF
5	sSrcClass	Source Class	2 Bytes	Indicating host	\x06\x00
6	sDestClass	Destination Class	2 Bytes	Broadcast	\x00\x00
7	sLength	Length	2 Bytes		
8	sPacketType	Packet Type	2 Bytes	Indicating this is a DLM message	\xBD\x02
9	lMsgID	Message ID	4 Bytes	No ack will be sent from the receiver	\xFF\xFF\xFF\xFF
10	Message / Payload		X Bytes		
11	Footer		4 Bytes	Reserved 4 bytes of zero	\x00\x00\x00\x00
12	Total		∑XX Bytes	Total sum of bytes that must be calculated to be used in field 7 above.	

"Mod.In.Mute=A 1" is in HEX "4D 6F 64 2E 49 6E 2E 4D 75 74 65 3D 41 20 31 00" (total of 16 bytes) this is the payload on field 10. (it is in real 15 bytes, but the total (field 12) needs to be possible to divide by 4 so one additional byte of \x00 is added to the end of the payload making 15 increase to 16.).

As this is 16 bytes, the total is 48 bytes. This means that on field 7 the total is written, and 48 is HEX 30, and as the length is 2 bytes it is \x30\x00.

Complete table for Mod.In.Mute=A 1:

#	Field	Name	Size	Comment	Example Hex (\x…)
1	lSrcIDHi	Source ID	4 Bytes	ID of the Controller	\x00\x00\x00\x00

2	LSrcIDLo	Source ID	4 Bytes		\x01\x00\x00\x00
3	lDestIDHi	Destination ID	4 Bytes	According to Destination ID this is BROADCAST	\xFE\xFF\xFF\xFF \xFD\xFF\xFF\xFF
4	lDestIDLo	Destination ID	4 Bytes		
5	sSrcClass	Source Class	2 Bytes	Indicating host	\x06\x00
6	sDestClass	Destination Class	2 Bytes	Broadcast	\x00\x00
7	sLength	Length	2 Bytes	48 from the total	\x30\00
8	sPacketType	Packet Type	2 Bytes	Indicating this is a DLM message	\xBD\x02
9	lMsgID	Message ID	4 Bytes	No ack will be sent from the receiver	\xFF\xFF\xFF\xFF
10	Message / Payload		X Bytes	Mod.In.Mute=A 1	\x4D\x6F\x64\x2E\x49\x6E\x2E\x4D\x75\x74\x65\x3D\x41\x20\x31\x00
11	Footer		4 Bytes	Reserved 4 bytes of zero	\x00\x00\x00\x00
	Total		∑48 Bytes	Total sum of bytes that must be calculated to be used in field 7 above.	

12.1.8 Hex string to send (\x Hex identifier)

\x00\x00\x00\x00\x01\x00\x00\x00\xFE\xFF\xFF\xFF\xFD\xFF\xFF\xFF\x06\x00\x00\x00\x30\00\xBD\x02\xFF\xFF\xFF\xFF\x4D\x6F\x64\x2E\x49\x6E\x2E\x4D\x75\x74\x65\x3D\x41\x20\x31\x00\x00\x00\x00\x00

12.2 To a unique PLM or LM unit on the network with ack sent

This is a short example of HEX string, for an example where we want to put a unique frame on the network to standby and want a ack confirming the result.

#	Field	Name	Size	Comment	Example Hex (\x…)
1	lSrcIDHi	Source ID	4 Bytes	**ID of the Controller, must be incremented for each packet**	\x10\x00\x00\x9B
2	LSrcIDLo	Source ID	4 Bytes		\x01\xBB\xB8\xFC
3	lDestIDHi	Destination ID	4 Bytes	According to Destination ID this is to a specific device on the network. This is the FrameID of the specific device.	\x01\x24\x45\x67
4	lDestIDLo	Destination ID	4 Bytes		\x89\x10\x11\x13
5	sSrcClass	Source Class	2 Bytes	Indicating host	\x06\x00
6	sDestClass	Destination Class	2 Bytes	To a specific destination	\x05\x00
7	sLength	Length	2 Bytes	The total sum of Bytes is 44 that equals 0x2C	\x2C\x00
8	sPacketType	Packet Type	2 Bytes	Indicating this is a DLMmessage	\x02\x00
9	lMsgID	Message ID	4 Bytes	Ack will be sent from the reciver to the source	\x45\x00\x00\x00
10	Message / Payload		12 Bytes	This is the HEX message for "Dev.Power=0"	\x44\x65\x76\x2E\x50\x6F\x77\x65\x72\x3D\x30\x00
11	Footer		4 Bytes	Reserved 4 bytes of zero	\x00\x00\x00\x00
	Total		∑44 Bytes	Total sum of bytes that must be calculated to be used in field 7 above.	

12.2.1 Hex string to send (\x Hex identifier)

\x10\x00\x00\x9B\x01\xBB\xB8\xFC\x01\x24\x45\x67\x89\x10\x11\x13\x05\x00\x06\x00\x2C\x00\x02\x00\x45\x00\x00\x00\x44\x65\x76\x2E\x50\x6F\x77\x65\x72\x3D\x30\x00\x00\x00\x00\x00

13 Appendix E: Example of Msg_Ack packet

Here is an example of a Msg_Ack packet:

// Packet Header
Hdr.sLength = 16 (0x0010)
Hdr.sType = 2 (0x0002 – Msg_Ack)
Hdr.lMsgID = 0x12345678

// Payload
lResult = -2 (0xFFFFFFFE)

// Packet footer
lChecksum = 0x0003F933

The resulting byte stream (in hex) for the packet would be:

AA 10 00 02 00 78 56 34 12 FE FF FF FF 33 F9 03 00

Here is an example of a Msg_DLMMsg packet that is sending a "Dev.InputSen?1" command:

// Packet Header
Hdr.sLength = 28 (0x001C)
Hdr.sType = 701 (0x02BD – Msg_DLMMsg)
Hdr.lMsgID = 21 (0x00000015)

// Payload padded with an extra zero to end to ensure that the footer
// starts on a 4 byte boundary
Dev.InputSen?1 (44 65 76 2E 49 6E 70 75 74 53 65 6E 3F 31 00 00)

// Packet footer
lChecksum = 0x003ADFED

The resulting byte stream for the packet would be:

AA 1C 00 BD 02 15 00 00 00 44 65 76 2E 49 6E 70 75 74 53 65 6E 3F 31 00 00 ED DF 3A 00