

W ashlight HP squarcle

Operating Instruction

As of 07/02

DMX Software version HP16T V3.2 and above



amptown lichttechnik gmbh
wandsbeker straÙe 26
d-22179 ham burg , germ any

fon +49 (0) 40 - 64 60 04 - 42
fax +49 (0) 40 - 64 60 04 - 47

technik@ amptown-lichttechnik.de
www .amptown-lichttechnik.de

Washlight HP squarcle

with:

- ◆ daylight lamp 575 W
- ◆ 16-bit servo card
- ◆ dipless colour mixing
- ◆ dipless daylight to tungsten conversion (CTO)
- ◆ dipless focus (7°- 28°)
- ◆ barn door effect

1	General Information	2
1.1	Product Description	2
1.2	Safety Instructions	2
1.3	Technical Data	5
1.4	DMX Channel Settings (Software HP16T).....	6
1.5	DIP Switch Settings DMX Card	9
2	Preparing to Operate the Washlight	11
2.1	Power supply	11
2.2	Lamp (Bulb).....	11
2.3	DMX	11
3	Functions	13
3.1	Dimmer	13
3.2	shutter.....	13
3.3	Pan / Tilt	13
3.4	Colour Mixing.....	13
3.5	Daylight to Tungsten conversion (CTO)	14
3.6	Focus.....	15
3.7	Auxiliary Channel	15
3.8	Power Down	16
3.9	Barn Door Effect	16
3.10	Test Mode	17
4	Appendix	19
4.1	Dimensioned Drawings (in mm).....	19
4.2	Block Diagram	21
4.3	LED Functions.....	22
4.4	Stepper Card (X-Lite 10).....	24
4.5	Declaration of Conformity.....	25
4.6	OSRAM HMP - Warnings and Instructions for Use	26

1 General Information

1.1 Product Description

The Washlight HP is a moving head, Fresnel- or PC-lens spotlight with variable colour mixing based on the colours yellow, magenta, and cyan. In addition there is a dipless conversion from daylight to tungsten. As its light source, a highly effective daylight lamp - surrounded by an elliptical cold-beam micro-glass reflector - has been employed. The lamp can be switched on/off via DMX with the possibility of hot restrike. A built-in mechanical dimmer allows for dipless fades and shutter functions. In the boost mode the lamp works with 700W. Various beam angles are made possible by a movement of the front lens. The barn door effect enables variable shaping of the cone of light. In order to meet the demands of very dynamic movements, the Washlight HP employs extremely robust and powerful servo-motors. The head of the Washlight HP with daylight lamp is convection-cooled with a special cooling system - there is only one small ventilator in the base. The Washlight is controlled internally by a 32-bit high-performance controller as well as a 16-bit DSP (digital signal processor), among others.

All functions can be remote-controlled with the DMX 512/1990 serial interface. For safety reasons, this interface is galvanically separated from the entire electronics.

Service and maintenance are greatly facilitated due to easy lamp replacement and plug-in electronic units.

The housing has a black, extremely resistant, powder-coated finished.

1.2 Safety Instructions

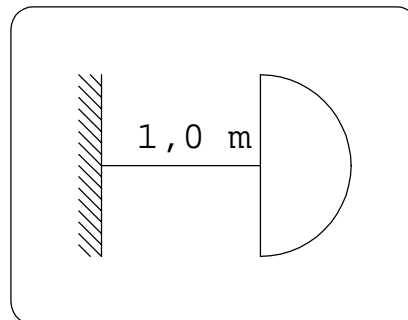
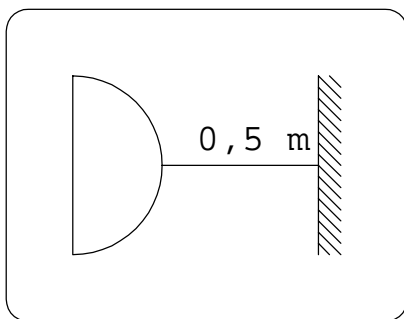
he following safety instructions and technical data are necessary for trouble-free functioning of the unit as well as for the prevention of injury / damage to people / objects. For this reason, all safety and technical requirements must be followed without exception. Failure to do so exempts Amptown Lichttechnik GmbH from any and all liability for both the unit's guarantee / warranty and any resulting injuries and / or damages.

These instructions should be seen as an integral part of the Washlight HP, and should be kept with it at all times:

- Before opening the unit, it must be removed entirely from the power supply (pull out the plug)!

- Protective Class I: Only insert unit's plug into socket with protective plug
reception with nonfused earth conductor!
The mains cross-sections must be capable of handling the required power input!

- Allow the bulb to cool before replacing it!
- Follow installation instructions provided by the bulb's manufacturer!
- Protective type IP 20 (NOT rain-, drip-, or splash-proof)! For outdoor use, a suitable dome is available.
- Keep away from all flammable materials (see diagrams below for distances to be maintained)!



- Unit's ventilation slits should never be covered or blocked, and must be cleaned when dirt / dust builds up!
- Never insert any bodily parts or other objects through the housing openings into the unit!
- In case of malfunction, the unit must be removed immediately and entirely from the power supply, and may not be operated again until personnel described below has undertaken repairs!
- The unit may be operated from any position.
- It is of utmost importance that there be enough room for the lamp yoke's and head's pan and tilt movements!
- Required free space incl. unit: 500x500x750 mm (Width x Depth x Height, standing on ground)
- The unit may not be operated within reach of people and / or any accidental contact with the unit must be prevented via appropriate warning signs or barriers!

- When operating the unit from a hanging position, the unit must be secured via the mounting brackets designed for this purpose. To do so, two points with a load-carrying capacity of 250 Newtons each are necessary.
- Repair service and maintenance on and within the unit are to be carried out by qualified personnel only! These qualified personnel must either have well-founded technical knowledge or have received instructions from the manufacturer.

1.3 Technical Data

Power supply:	180 - 255 V / 50 - 60 Hz
Power consumption:	900 VA max.
Mains Connection:	1 Meter H07RN-F 3G1,5 ² with plug
Signal (galvanic separated):	DMX 512/1990 - 16 channels
- Input ($R_{in} = 800 \text{ Ohm}$):	XLR 5-pol, male
- Output (activ, 60mA):	XLR 5-pol, female

Input and Output must not be exchanged in function!

DMX pin configuration:

pin 1 = GND (shield)

pin 2 = data -

pin 3 = data +

Movement:	pan = 340° tilt = 270°
Dipless colour mixing:	cyan, magenta, yellow (CMY)
Dipless conversion:	6000K ... approx. 3400K
Variable focus/beam angle:	approx. 7° - 28° (with Fresnel-lens)
Build-in mechanical dimmer:	0 - 100%
Max. working temperature:	$t_a = 40^\circ\text{C}$
Max. housing temperatur:	$t_{max} = 90^\circ\text{C}$ (at head's end)
Weight:	25 kg
Lamp:	OSRAM HMP 575 SE
Lamp power:	400W (power down) 575W (normal operation) 700W (boost)

Design and technical detail subject to be changed.

14 DMX Channel Settings (Software HP16T)

Channel 1 = dimmer, dipless fades

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	brightness 0%
255	100%	FF H	brightness 100%

Channel 2 = shutter

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	shutter closed
15	6%	0F H	strobe 1 - slow
25	10%	19 H	strobe 2
35	14%	23 H	strobe 3
45	18%	2D H	strobe 4
55	22%	37 H	strobe 5 - fast
65	26%	41 H	random strobe 1 (under construction)
75	30%	4B h	random strobe 2 (under construction)
85	33%	55 H	strobe, soft - soft
95	37%	5F H	strobe, soft
105	41%	69 H	strobe, soft
115	45%	73 H	strobe, soft
125	49%	7D H	strobe, soft
135	53%	87 H	strobe, soft
145	57%	91 H	strobe, soft
155	61%	9B H	strobe, soft - fast
165	65%	A5 H	strobe, hard - slow
175	69%	AF H	strobe, hard
185	73%	B9 H	strobe, hard
195	76%	C3 H	strobe, hard
205	80%	CD H	strobe, hard
215	84%	D7 H	strobe, hard
225	88%	E1 H	strobe, hard
235	92%	EB H	strobe, hard - fast
255	100%	FF H	shutter open

Channel 3 = Movement, horizontal, pan - coarse

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	horizontal -170°
127	50%	7F H	horizontal 0° (mid-position)
255	100%	FF H	horizontal +170°

Channel 4 = Movement, horizontal, pan - fine

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	
127	50%	7F H	
255	100%	FF H	

Channel 5 = Movement, vertical, tilt - coarse

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	vertikal -135°
127	50%	7F H	vertikal 0° (mid-position)
255	100%	FF H	vertikal +135°

Channel 6 = Movement, vertical, tilt - fine

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	
127	50%	7F H	
255	100%	FF H	

Channel 7 = Yellow, dipless

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	no yellow (clear)
220	86%	DC H	full yellow

Channel 8 = Magenta, dipless

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	no magenta (clear)
220	86%	DC H	full magenta

Channel 9 = Cyan, dipless

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	no cyan (clear)
220	86%	DC H	full cyan

Channel 10 = colour conversion (CTO), dipless

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	daylight 6000 Kelvin
220	86%	DC H	tungsten approx. 3400 Kelvin

Channel 11 = focus, dipless

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	flood - beam angle 28°
220	86%	DC H	spot - beam angle 7°

Channel 12 = Auxiliary Channel (normal:DIP8 OFF): Reset servo & stepper

Decimal	Percentage	HEX-Code	Function
from 0	0%	00 H	normal operation
to 31	12%	1F H	normal operation
from 32	13%	20 H	lamp off
to 201	79%	C9 H	lamp off
202	...	CA h	RESET - servo
203	...	CB H	RESET - stepper + servo
204	...	CC H	RESET - stepper
from 205	80 %	CD H	boost, 700W
to 255	100%	FF H	boost, 700W

Channel 12 = Auxiliary Channel (Extra: DIP8 ON): Reset servo & stepper

Decimal	Percentage	HEX-Code	Function
from 0	0%	00 H	no change
to 50	19,6%	32 H	no change
from 51	20%	33 H	lamp on, 575W
to 100	39,2%	64 H	lamp on, 575W
from 101	39,6%	65 H	lamp off
to 150	58,8%	96 H	lamp off
from 151	59,2%	97 H	no change
to 201	78,8%	C9 H	no change
202	79,2%	CA H	RESET - Servo
203	79,6%	CB H	RESET - Servo + Stepper
204	80,0%	CC H	RESET - Stepper
from 205	80,4%	CD H	no change
to 239	93,7%	EF H	no change
from 240	94,1%	F0 H	Boost, 700W
to 255	100%	FF H	Boost, 700W

Channel 13 = Barn Door Rotation

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	1 th Stop
255	100%	FF H	2 nd Stop

Channel 14 = Barn Door 1/2

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	doors open
255	100%	FF H	doors closed

Channel 15 = Barn Door 3

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	door open
255	100%	FF H	door closed

Channel 16 = Barn Door 4

Decimal	Percentage	HEX-Code	Function
0	0%	00 H	door open
255	100%	FF H	door closed

Note:

yellow + magenta = red
 magenta + cyan = blue
 cyan + yellow = green

1.5 DIP Switch Settings DMX Card

Software version DMX-2: WL-HP16T V 3.2 and above

Switch (S2) in front on the DMX card:

DIP	Function	on	off
1			
2	failure input	active	passive
3	DMX start address	blocks of 16 channels	1... 512 (individual)
4	no DMX signal	maintain current settings	basic position (default)

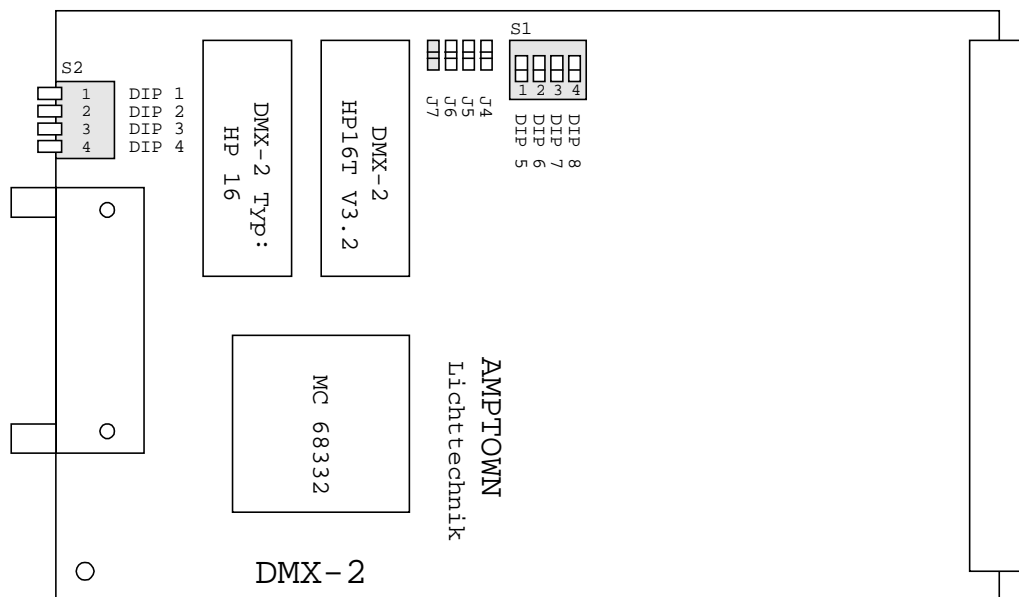
Switch (S1) in back on the DMX card (the card must be pulled out):

DIP	Function	on	off
5	DMX channel 12 (aux.)	passive	active
6	Lamp after DMX failure	off	on
7	Boostfunction	off (for HMI 575)	on
8	Auxiliary channel type	Modus 2 (extra)	Modus 1 (normal)

Jumper in back on the DMX card (the card must be pulled out):

DIP	Function	in	open
7	Barn Door channels (13..16)	on (16 channels)	off (12 channels)
6			
5			
4			

boldface: adjustment on delivery



2 Preparing to Operate the Washlight

2.1 Power supply

The Washlight comes with a standard 1-metre power supply cable and shrouded contact plug. The power supply cable must be plugged into a socket with protective plug reception and nonfused earth conductor. The socket's fuse should be not less than 6 amps and not greater than 16 amps.

2.2 Lamp (Bulb)

There is currently only one bulb available: **OSRAM HMP 575 SE**
The manufacturer specifies the lamp with a 1000h average lifetime.

Please follow bulb manufacturer's instructions!

2.3 DMX

DMX connection is done via a regular 5-pin XLR connector (e.g., Switchcraft, Neutrik).

Input (DMX in):	male	Pin:	1 = Ground (GND)
Output (DMX out):	female		2 = Data -
			3 = Data +

The DMX LED will light up green when the DMX data are valid; if not, it will be yellow. If there is no DMX signal, the unit's performance is adjusted on the DMX card with DIP switch 4: either maintain current settings or go to basic position.

If an invalid DMX address is entered, the DMX LED will blink green/yellow and the moving light will return to its basic position (default). For the addresses 800 and upward, a test mode is implemented; with this mode, it is possible to check the unit's individual functions - including without DMX.

For operational safety and conformity to European CE regulations, only shielded DMX cable may be used. The shield must be on Pin 1 (ground).

For safety reasons, the DMX inputs and outputs are galvanically separated from the entire electronics.

In order to increase operational reliability, each output is "active"; i.e., the DMX signal is boosted by each unit. This means that any number of

ControLite moving lights can be connected to one DMX line. A terminating resistance is not necessary.

If a unit is not connected to the power supply, the DMX signal is automatically looped through.

If the DMX signal has to be manually split, a maximum of two Washlights can be directly connected to one output. Should you need to run more than two units parallelly, an active splitbox is required.

The DMX input within the unit has an impedance of 800 Ohm.



prohibited

DMX in- and outputs must
be mixed-up.

The Washlight controls require 16 DMX channels per unit. Please refer to section 1.4 DMX for channel distribution and their corresponding functions.

The start address for the first channel of the unit must be defined using the three-digit code switch located on the yoke.



TIP

Setting a new start address may effect the yoke
change the position and whiggle around.

To avoid movement while setting a new start address
press the "RESET" button the same time.

The Washlight does not have to be connected to the power supply in order to enter the unit's start address!

3 Functions

3.1 Dimmer

The mechanical dimmer is built into the Washlight. You may control this function via the DMX 512 interface on **Channel 1** from 0 = "off" to 255 = "on".

3.2 shutter

The shutter function is based on the mechanical dimmer, but uses it's own DMX channel. Use **Channel 2** to effect „shutter closed“ on factor 0 to „shutter open“ on factor 255.

3.3 Pan / Tilt

The unit's servo-card controls movement of both axes (head and yoke). For both axes, there is a corresponding channel for coarse and fine adjustment.

Channel 3 = yoke / pan coarse (DMX 0 - 255)

Channel 4 = yoke / pan fine (DMX 0 - 255)

Channel 5 = head / tilt coarse (DMX 0 - 255)

Channel 6 = head / tilt fine (DMX 0 - 255)

As soon as the light is connected to the power supply, the servo-card executes a set-up movement (servo reset) on its own. During this procedure, all positions are carried out at slow speed. Also, the servo LED blinks during this time.

The card is equipped with overload protection for the gears. If one of these precautionary measures registers a malfunction, the red servo LED will come on immediately and the motors will disengage. If you are unable to solve the problem by pushing "RESET" or by briefly disconnecting from the power supply, there is a malfunction.

3.4 Colour Mixing

For the infinitely variable colour mixing, there are three basic colours (yellow, magenta, and cyan) available. Their channel distribution via the DMX interface is as follows:

Channel 7 = yellow

Channel 8 = magenta

Channel 9 = cyan

The following control info applies to all three colours:

DMX 0 / 0% /00H = none of the corresponding colour
DMX 220 / 86% /DCH = saturated (full) colour

DMX values higher than the above-mentioned maximum setting (220 / 86% / DCH) correspond to the saturated colour as well.

**TIP**

yellow + magenta = red
magenta + cyan = blue
cyan + yellowgreen

Get best results in colour mixing by using two colours at the same time, only. Using all three colours will have a fade-out effect your colour mixing in any positive way.

Get a black-out effect by setting all colours to zero intensity. The remaining light will be less than before. Fade out the dimmer and you'll receive a nice black-out.

3.5 Daylight to Tungsten conversion (CTO)

There is a separated effect-wheel for conversion from daylight (6000K) to tungsten (approx. 3400K). Convert dipless via **DMX Channel 10**.

DMX 0 / 0% /00H = daylight (6000K)
DMX 220 / 86% /DCH = tungsten (3400K)

There is an option to employ a wheel with 4 fixed colours instead of the CTO wheel.

3.6 Focus

The focus allows you to diplessly change the beam angle from 7° to 28°. Control of this function is via **DMX Channel 11**. Resolution is 8-bit. It takes approx. 2 seconds for the entire procedure (7° --> 28°).

3.7 Auxiliary Channel

The **DMX-Kanal Nr. 12** controls three aux functions : lamp on/off, lamp boost and reset.

Normal Modus: (DIP8 off)

Factors 0 to 31 runs the lamp at the standard setting (575W). Factor 32 to 202 switches the lamp off (the lamp LED indicates „red“). Remember: only switch off the lamp for longer periods of time, as any restart of the lamp reduces it's lifetime for hours.

Three different resets are controlled by the aux channel:

With DMX setting 202, only a servo reset is carried out.

With DMX setting 203, both a servo and a stepper reset are carried out.

With DMX setting 204, only a stepper reset is carried out.

Factors 204 to 255 runs the lamp at the 700W boost setting (the lamp LED indicates „yellow“). Keep in mind that using the boost setting not only increases the brightness but also reduces the average lifetime at about 50%. To avoid losing information on the bulbs total running time while switching between the settings, the build-in counter runs in proportion even faster or slower depending on the setting chosen.

Extra Modus: (DIP8 on)

Factors 0 to 50 are no changes. Factors 51 to 100 runs the lamp at the standard setting (575W) the lamp LED indicates „green“. Factor 101 to 150 switches the lamp off (the lamp LED indicates „red“). Remember: only switch off the lamp for longer periods of time, as any restart of the lamp reduces it's lifetime for hours. Factors 151 to 201 are no changes.

Three different resets are controlled by the aux channel:

With DMX setting 202, only a servo reset is carried out.

With DMX setting 203, both a servo and a stepper reset are carried out.

With DMX setting 204, only a stepper reset is carried out.

Factors 205 to 239 are no changes. Factors 240 to 255 runs the lamp at the 700W boost setting (the lamp LED indicates „yellow“). Keep in mind that

using the boost setting not only increases the brightness but also reduces the average lifetime at about 50%.

To avoid losing information on the bulbs total running time while switching between the settings, the build-in counter runs in proportion even faster or slower depending on the setting chosen.

Note: The 700W boost mode is not made for permanent use.

3.8 Power Down

Facing an increasing head temperature when setting the dimmer wheel into close position (factor 0 to 3), we made the bulb switch into power down mode right after 30 seconds remaining in this constitution. You will also find the stepper LED indicating „yellow“, then. Due to the fact that the bulb runs on 400W in power down, the approximate lifetime of the lamp will be reduced as much as if running in boost mode (700W). Therefore the build-in counter clock will run even faster than in „normal“ mode to cover up with the decrease of the bulb's lifetime. Technically speaking we do double the trigger frequency.

3.9 Barn Door Effect

The barn door effect allows the lighting designer to shape the spot's beam. To do so, there are 4 doors available: **DMX Channel 12** controls an elliptical pair of doors (1 / 2), which allows for an oval shaping of the beam. The **DMX Channels 13 and 14** each control a straight door (3, 4). The doors can be brought into the desired position via **DMX Channel 11** (door rotation).

Please keep in mind that the motors are meant to position the doors, but are NOT made for a constant movement effect!



prohibited

Never pull out electrical
while the Washlight is working
Electrical parts could be

3.10 Test Mode

A test mode has been implemented in the DMX software, version HP16T V3.0 and above; this mode allows you to check the Washlight functions directly (including without DMX).

Select the test mode via the BCD code switch (which is normally responsible for selecting the DMX start address).

The individual test functions:

BCD-Switch	DMX-Channel	Function
800	...	Lamp on only
801	1	Dimmer 100%, pan & tilt 50%
802	2	Shutter - Strobe 5, pan & tilt 50%
803	3	Dimmer 0%, Pan coarse 100%, tilt 0%
804	4	Dimmer 0%, Pan coarse + fine 100%, Tilt 0%
805	5	Dimmer 0%, Pan 0%, Tilt coarse 100%
806	6	Dimmer 0%, Pan 0%, Tilt coarse + fine 100%
807	7	Dimmer 100%, pan & tilt 50%, yellow 100%
808	8	Dimmer 100%, pan & tilt 50%, magenta 100%
809	9	Dimmer 100%, pan & tilt 50%, cyan 100%
810	10	Dimmer 100%, pan & tilt 50%, CTO 100%
811	11	Dimmer 100%, pan & tilt 50%, focus 100%
812	12	Dimmer 100%, pan & tilt 50%, boost - 700W
813	13	Dimmer 100%, pan & tilt 50%, door rotation 100%
814	14	Dimmer 100%, pan & tilt 50%, doors 1/2 100%
815	15	Dimmer 100%, pan & tilt 50%, door 3 100%
816	16	Dimmer 100%, pan & tilt 50%, door 4 100%
900	...	Lamp off only
000	/	default settings, DMX-LED blinks yellow/green
496 to 799	/	default settings, DMX-LED blinks yellow/green
817 to 899	/	default settings, DMX-LED blinks yellow/green
901 to 999	/	default settings, DMX-LED blinks yellow/green

The lamp can be switched on/off with the codes 800 and 900.

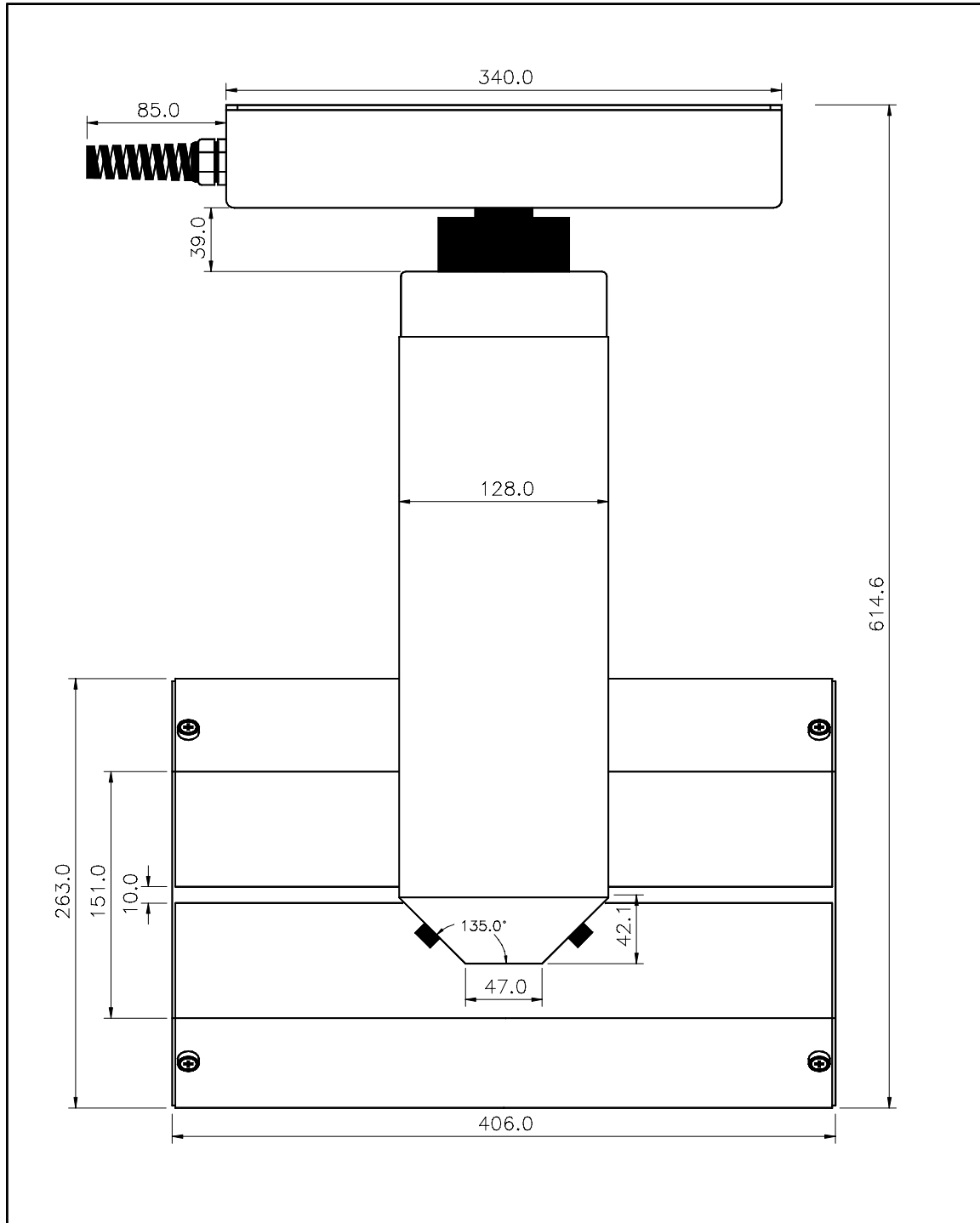
Codes 801 to 816 correspond to DMX channels 1 to 16, the lamp setting does not change.

With all other invalid DMX start addresses, the Washlight will go to its default position:
head horizontal, yoke 50%, focus forward, door rotation 100%, the rest 0%.

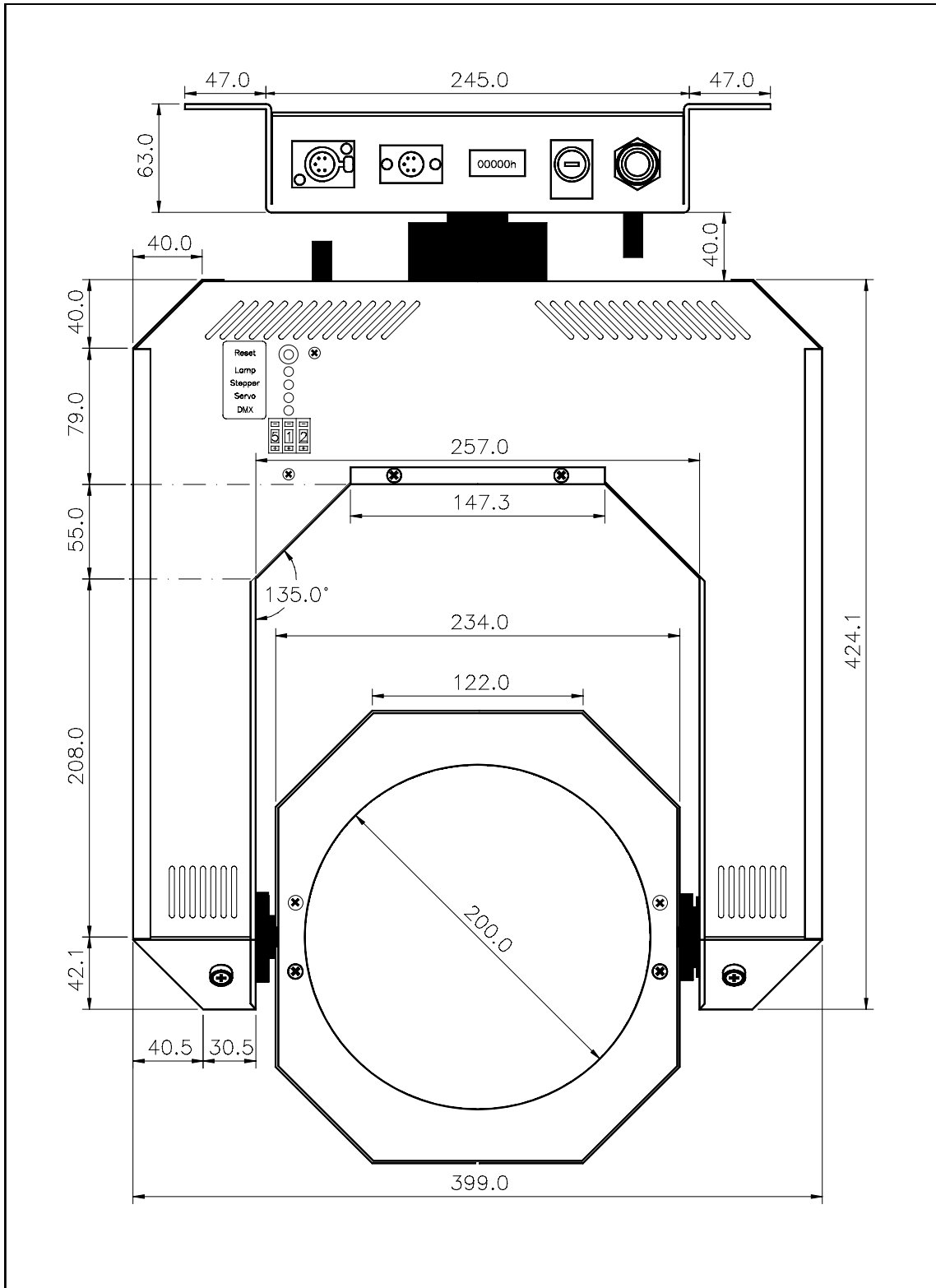
4 Appendix

4.1 Dimensioned Drawings (in mm)

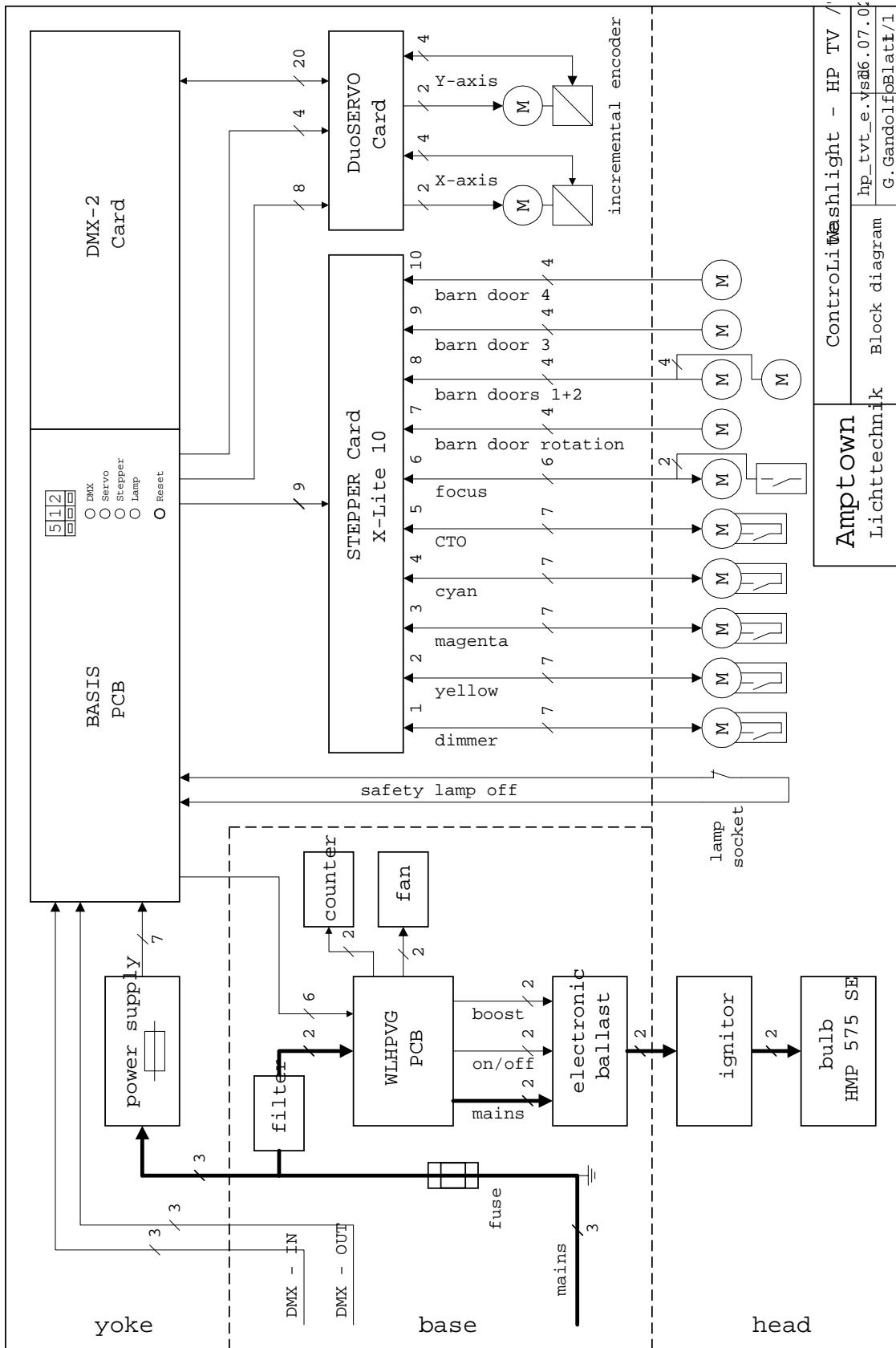
Side View



Front View



4.2 Block Diagram



Controlite Washlight - HP TV /	
Amptown	Block diagram
Lichttechnik	hp_tvt_e_vst06.07.02
	G.GandolfBlatt/1

4.3 LED Functions

Functions of the LED's on the BASIS PCB:

5	1	2
---	---	---

LED:	green	yellow	red	flash
DMX	DMX O.K.	no DMX	- - -	DMX address not O.K.
Servo	servo O.K.	- - -	servo failure	servo reference
Stepper	stepper O.K.	power down/stepper reference	stepper failure	- - -
Lamp	575W lamp on	700W lamp boost	lamp off	- - -

Reset switch

Amptown	ControlLight - HP TV
Lichttechnik	LED - functions
	ledhptve.vsb5.07.02
	G.Gandolfosheet/1

4.4 Stepper Card (X-Lite 10)

Stepper Card (X-Lite 10)

Controlite Washlight HP .. / T

x_hpt_e.vsd 6.07.06

G. Gandoi

Amptown

Lichttechnik

stepper motors:

1 dimmer

2 yellow

3 magenta

4 cyan

5 CTO

6 focus

7 barn door rotation

8 barn doors 1/2

9 barn door 3

10 barn door 4

LED:

- not used (off)
- RS-485 data
- not used (off)
- not used (off)
- not used (off)

Jumper:

- J1
- J2
- J3
- J4

Supply connection:

Pin	Colour	Signal
1	yellow	RS 485 + data
2	green	RS 485 - data
3...5	n.c.	
6	orange	signal stepper
7	brown	GND
8	violet	+ 5V
9,10	black	GND - motor
11,12	red	+ 24V - motor

Stepper connection:

Pin	Colour	Signal
1	black	stepper winding 1
2	brown	stepper winding 1
3	red	stepper winding 2
4	orange	stepper winding 2
5	yellow	GND
6	green	+ 5V - Vcc
7	blue	output: zero signal

Jumper:

Nr.	Funktion
1	auto correction off
2	res.
3	res.
4	res.

LED:

Funktion	Beschreibung
RS 485 data	flashes receiving new data
watchdog	flashes with software failure or aft
+ 5 V	always on
+ 24 V	always on

4.5 Declaration of Conformity

Manufacturer: Amptown Lichttechnik GmbH
Wandsbecker Str. 26
D-22179 Hamburg

Germany

Productname: Controlite

Type of Product: Washlight HX (Halogen) and Washlight HP (High Power)

We declare that the products listed above meet the
electromagnetic compatibility requirements of the
European
of the
Commission Directive and comply with the requirements
Directive by meeting the following standards:

Safety: EN 60598-1
EN 60598-2-17
VGB 70

EMC: EN 55103-1
EN 55103-2
EN 50081-1
EN 50082-1

Hamburg, July 10th 1997

Dipl.-Ing. Michael Knappe

