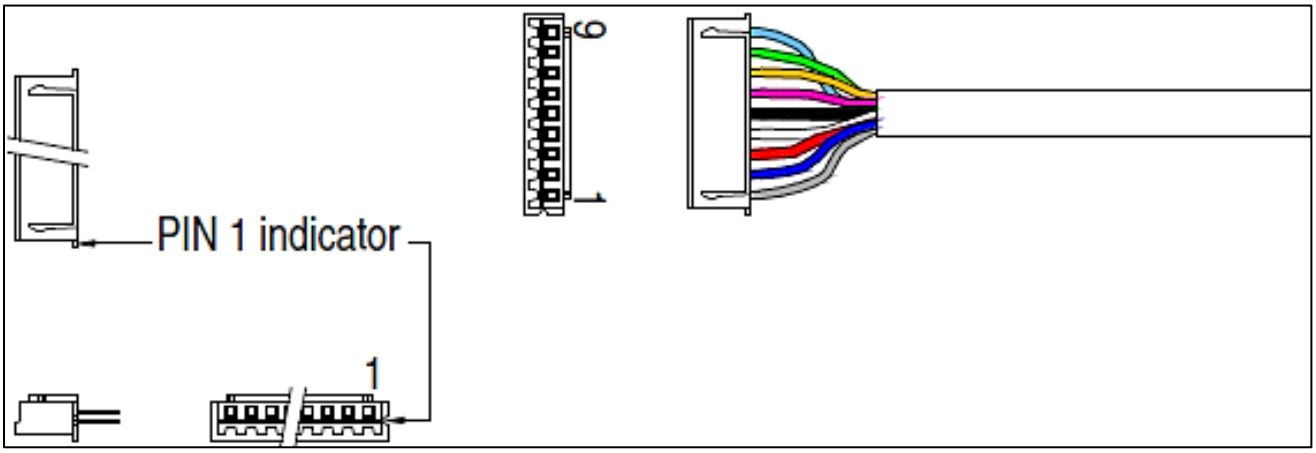
CBM-105 Connections

CN1 – 2 PIN connector for Power		Male Connector on Card WAGO #734-162	Female Connector for Wiring WAGO #734-102 TGW PN:1104417 & 18
PIN	**Description**		
1	+24VDC +/-10% (full-wave rectified, smoothed current <10% ripple)		Wire Size: 28-14AWG
2	0V		

CN2 5 PIN connector for external control		Male Connector on Card WAGO #733-335	Female Connector for Wiring WAGO #733-105 TGW PN:733105 & 1104417
PIN	**Description**		
1	+24V DC (Input) – RUN		Wire Size: 28-20AWG
2	+24V DC (Input) – DIR		
3	0-+10V DC (Input) – V-IN (Allows analog speed control, 1.6mA/card)		
4	+24V DC (Output) – ERR (Open collector: 25mA max)		
5	+24V DC (Output) – PLS (Open collector: 25mA max)		

CN3 – 9 PIN connector for Motor	Male Connector on Card JST #S9B-XH-A	Female Connector for Wiring JST #XHP-9
PIN	**Description**	
1	GND - Grey	Wire Size: 28-22AWG & 24-22AWG motor phases Terminal pins: JST #SXH-001T-P0.6
2	+12V DC – Blue	
3	Motor Phase U – Red	
4	Motor Phase V – White	
5	Motor Phase W – Black	
6	Hall Sensor U – Violet	
7	Hall Sensor V – Orange	
8	Hall Sensor W – Green	
9	Thermistor – Light Blue	



CBM-105 Installation Precautions

Precaution	Action	Reason
Power Supply	Power supply must be sized appropriately for the number of cards/rollers it provides power to. See "Power Supply Application Information" section.	Exceeding the power supply capacity can cause low voltage issues.
Multiple power supplies	0V line of all power supplies associated with a conveyor "unit" (cards, rollers, and external controls) need to be connected.	This completes the signal path between conveyor sections and system controls.
Voltage drop across power bus	Use suitable gauge wire in relation to distance and current draw.	Voltage must not drop below 21.6V DC or voltage faults will occur

CBM-105 User Interface Switch Settings

DIP Switches (SW1) – User Settings				
DIP Switch	**Function**	**ON**	**OFF**	**Default Setting**
1	Thermal device/low voltage/back EMF recover	Manual	Automatic (Thermal restarts 1min after cool down)	**ON**
2	Speed change selection	External (0~10V DC applied)	Internal (Rotary switch)	**OFF**
3	DIR* (No external DIR signal; viewed from cable side)	FS/FP – CCW FE – CW	FS/FP – CW FE – CCW	**OFF**
4	Error signal activity	Active during normal status	Active during abnormal status	**ON**
5	Brake mode	Servo	Dynamic	**OFF**
6	Error output (FN type)	PNP	NPN	**OFF**
	Error output (FP type)	PNP	NPN	**ON**

*External direction signal only. If a direction change signal should occur while the motor is running, the motor will first stop for 0.5s. The motor will then start in the new direction.

Rotary switch (SW2)

Applicable when using internal speed control (DIP-SW2 OFF)
Factory default position 9 (highest speed), TGW presets speeds on production beds

*Potentiometers**

VR1 – Acceleration
Adjust acceleration time from 0~2.5 seconds after the RUN signal is applied
VR2 – Deceleration
Adjust deceleration time from 0~2.5 seconds after the RUN signal is removed
*VR's turn 270°

Brake

Servo Brake mode with DIP-SW 1-5 ON

- Holds Power Moller in position 0.2 seconds after the RUN signal is removed
- If external force moves the Power Moller it will return back to its initial stopped position
- Maximum holding force is 17.7 lb.-in at 1.0 Amp (Based on a PM486FE-60)
- Servo brake does not function during an error condition

Motor pulse output signal

- NPN (0V) output from CN2-5
- Two (2) pulses per motor revolution

CBM-105 LED's and Error Indications

Status	LED1	LED2	ERR Output	Error	Result	Solution

	(green)	(red)	(DIP-SW4 setting)		Condition*		
			OFF	ON			
Normal	● (ON)	○ (OFF)	○	●	n/a	n/a	n/a
No power	○ (OFF)	○ (OFF)	○	○	n/a	No operation	
Thermal overload	● (ON)	● (ON)	●	○	Motor or PCB above operating temperature		1
Motor lock	● (ON)	Blinks (1Hz) ●○	●	○	Motor locked (>4s)		2
Motor unplugged	● (ON)	● (ON)	●	○	Motor not connected to card		3
Open Fuse	○ (OFF)	Blinks (6Hz) ●○●○●○ ●○●○●○	●	○	Current exceeded 5A		4
Back EMF	● (ON)	Blinks/off (6Hz) ●○●○●○ ○○○○○○	●	○	Supply voltage >40V DC for 2s, or 60V DC for 0.1s		5
Low voltage (<15V)	● (ON)	Blinks (6Hz) ●○●○●○ ●○●○●○	●	○	<15V DC (>1s or 5x in 0.5s)		6

Solution

1. See more information under Input / Output Settings, DIP switch 1-8
    - A signal applied to CN2-1 (RUN) or CN2-2 (DIR) will reset this error status
    - Thermal overload can only be reset if the temperature has fallen back into the operating range
2. Remove the cause of the motor lock and clear the zone
3. Remove power from the card, plug in the motor connector, and then reapply power
4. Replace the card
5. If card detects back EMF over 40V DC for 2sec or 60V DC for 0.1sec, the motor will stop running and go into dynamic brake condition to slow the product down
    - Back EMF results from forcing a roller to run at >150% of its set operating speed
    - If DIP-SW1 is ON (Manual recovery), card must be reset 1sec after voltage drops under 30V DC. Applying a signal to CN2-1 or CN2-1 will reset error.
    - If DIP-SW1 is OFF (Automatic recover), card will restart roller 1sec after the voltage drops below 30V DC (if run signal is active
6. Check power supply output, voltage drop along power bus, and roller count per power supply

CBM-105 Drivercard

CBM-105 DRIVERCARD / FE- _ _ _ ROLLER

ROLLER: FE-17			ROLLER: FE-60			ROLLER: FE-100			ROLLER: FE-140		
TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)	TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)	TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)	TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
6	0	6.9	**25**	0	24.6	**85**	0	87.5	**85**	0	87.5
9	1	9.2	**30**	1	32.8	**115**	1	116.6	**115**	1	116.6
13	2	13.8	**45**	2	49.2	**170**	2	174.9	**170**	2	174.9
18	3	18.4	**65**	3	65.6	**230**	3	233.2	**230**	3	233.2
25	4	27.7	**95**	4	98.4		4	349.7/(285.7)	**345**	4	349.7
35	5	36.9	**130**	5	131.2		5			5	466.3/(408.2)
40	6	41.5	**145**	6	147.6	**285**	6			6	524.7/(408.2)
45	7	46.1	**160**	7	164		7	433.1/(285.7)	**405**	7	
50	8	50.7/(48.0)	**180**	8	180.4/(170.6)		8			8	566.2/(408.2)
	9	55.3/(48.0)		9	196.8/(170.6)		9			9	

Note: Speed with two numbers are " NO-LOAD / RATED". Rated numbers are what the roller is capable of doing under a continuous duty full load condition.

CBM-105 DRIVERCARD / FP- _ _ _ ROLLER

ROLLER: FP-55			ROLLER: FP-100			ROLLER: FP-140		
TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)	TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)	TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
25	0	26.7	**120**	0	121.7	**120**	0	121.7
35	1	35.6	**160**	1	162.3	**160**	1	162.3
50	2	53.4	**240**	2	243.4	**240**	2	243.4
70	3	71.2		3	324.5/(306.3)	**320**	3	324.5
105	4	106.8		4			4	486.6/(470.7)
140	5	142.4		5			5	
160	6	160.2	**305**	6	446.0/(306.3)	**470**	6	
175	7	178.0/(175.5)		7			7	627.1/(470.7)
180	8	195.8/(175.5)		8			8	
	9	213.7/(175.5)		9			9	

Note: Speed with two numbers are " NO-LOAD / RATED". Rated numbers are what the roller is capable of doing under a continuous duty full load condition.

ITR CB-016 P7 and CB-105FP Electrical Components

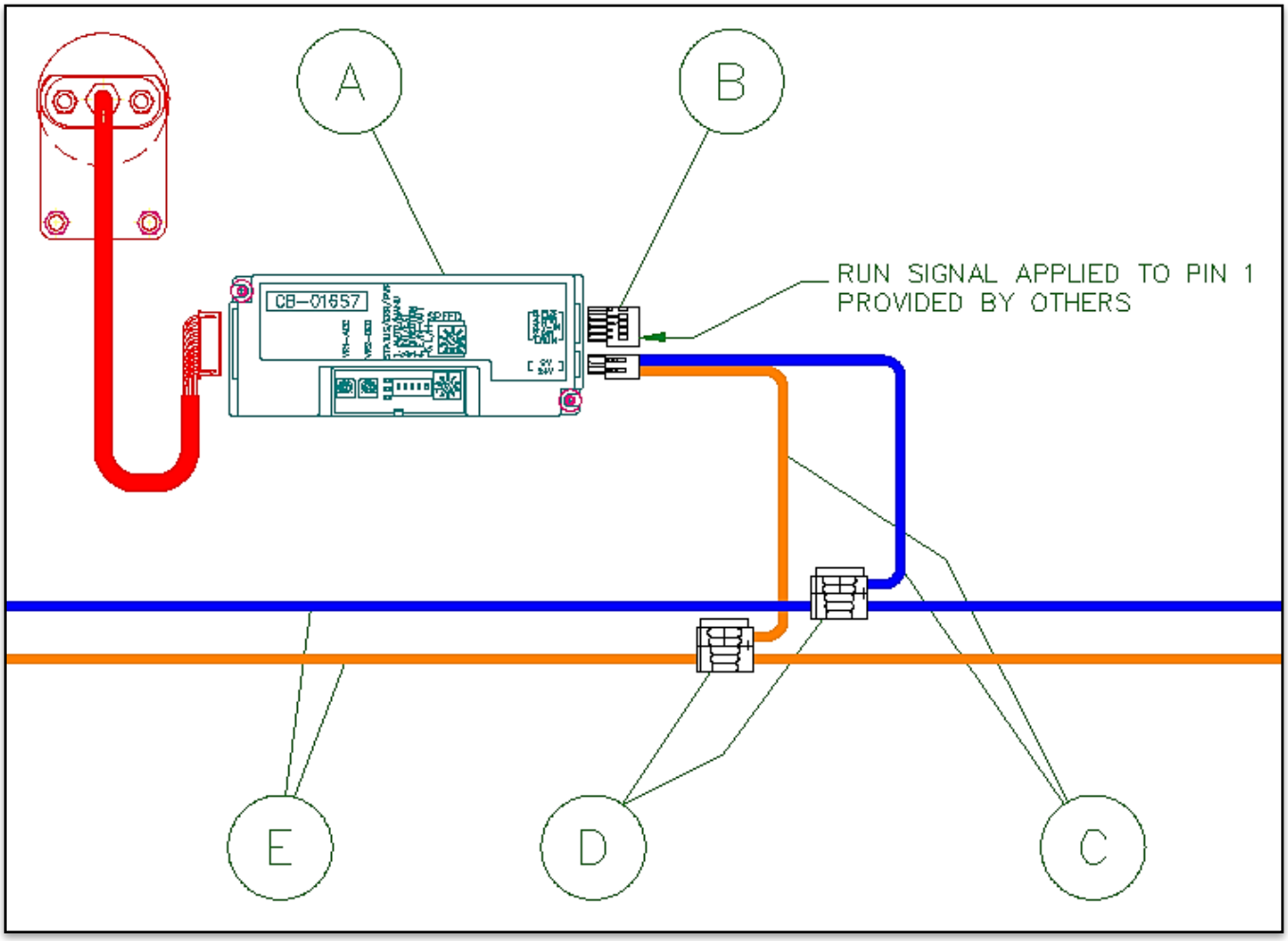


Figure 1 – CB-016 and CC-105 Drivercard

Ⓐ CB-016P7 Item (with hardware) 1139716
CB-105FP Item (with hardware) 1153931
Ⓑ 5-Pin connector (for run signal connection): 733105
Ⓒ Power tap cable (for short distances < 6”): 1139543
Ⓓ Scotchlok connectors (connect power tap to power harness): 3M567 (Brown)
Ⓔ Power harness – see power harness table

ITR Electrical Components

Table 3 Motor extension cables

Item No.	Description
1138704	CABLE,MOTOR EXTENSION, ITOH M-F-EXT-9-PIN-600mm
1138705	CABLE,MOTOR EXTENSION, ITOH M-F-EXT-9-PIN-1200mm
1138706	CABLE,MOTOR EXTENSION, ITOH M-F-EXT-9-PIN-2700mm

ITRHB-510 Electrical Components

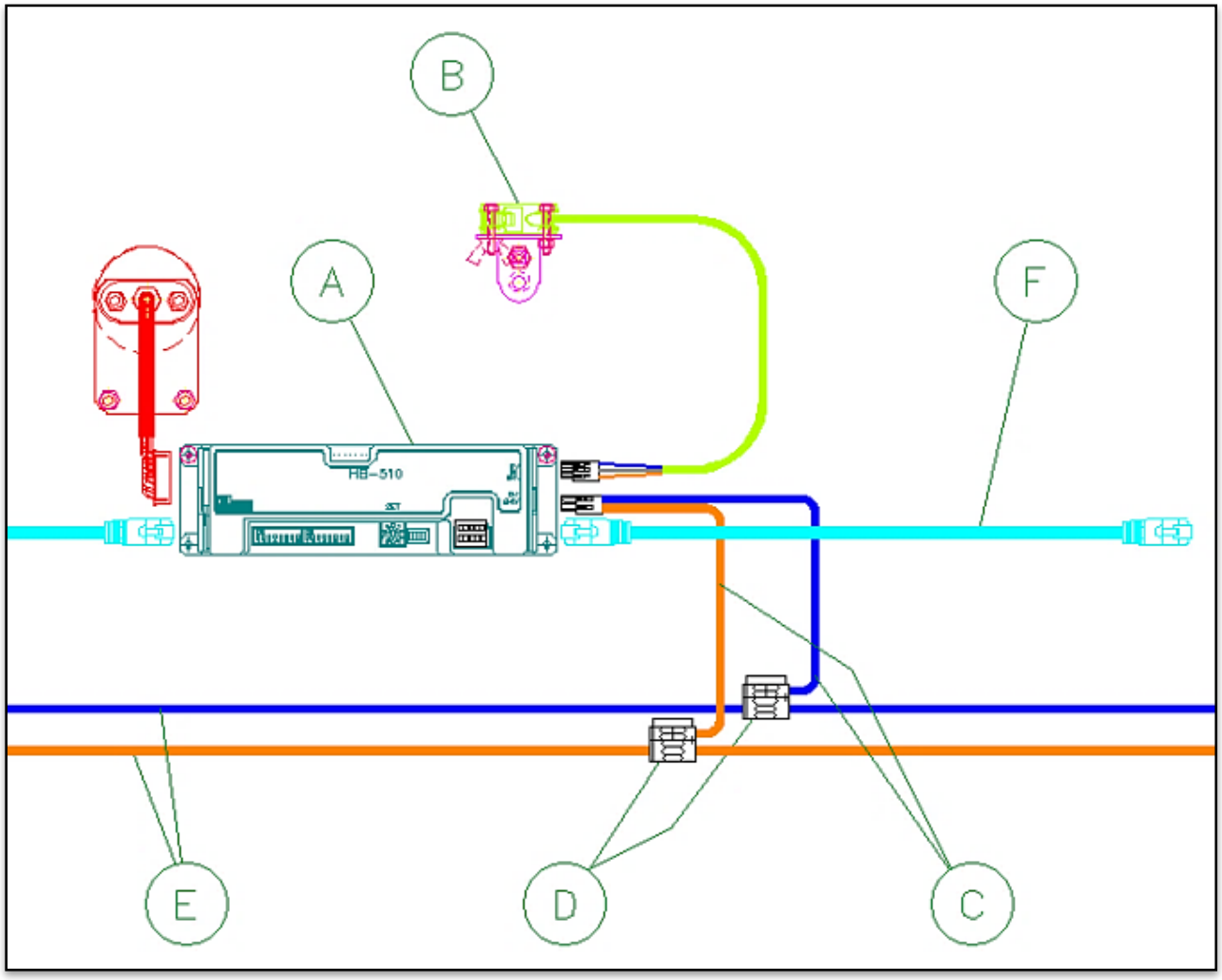


Figure 2 – HB-510 Drivercard

A HB-510 item (includes hardware and 5-pin connector): PN1137754

B Photoeye (ZL2 eye with 3-pin connector mounted to bracket with reflector in bag): PN1137686

C Power tap cables (for short distances < 6”): PN1139543

D Scotchlok connectors (connect power tap to power harness): 3M567 (Brown)

E Power harness: See table below

F Cat5E Communication Cable

Table 1: Power Harness

Item No.	Description
1102286	HARNESS,POWER,10AWG.10.5'
1102287	HARNESS,POWER,10AWG,8'
1102288	HARNESS,POWER,10AWG,5.5'
1102289	HARNESS,POWER,10AWG,3'

Item No.	Description
E0034025	CABLE,CAT5E 3” GRAY
E0034026	CABLE,CAT5E 5' GRAY
E0034027	CABLE,CAT5E 7' GRAY
E0030796	CABLE,CAT5E 10' GRAY
E0009905	CABLE,CAT5E 14' GRAY
E0009904	CABLE,CAT5E 25' GRAY

Table 2: Communication Cable

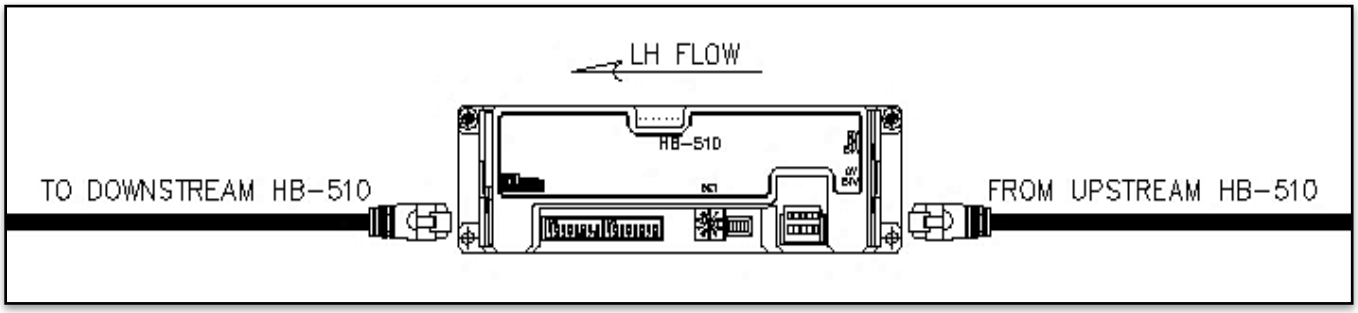


Figure 3 – HB 510 Communication Cable LH Flow

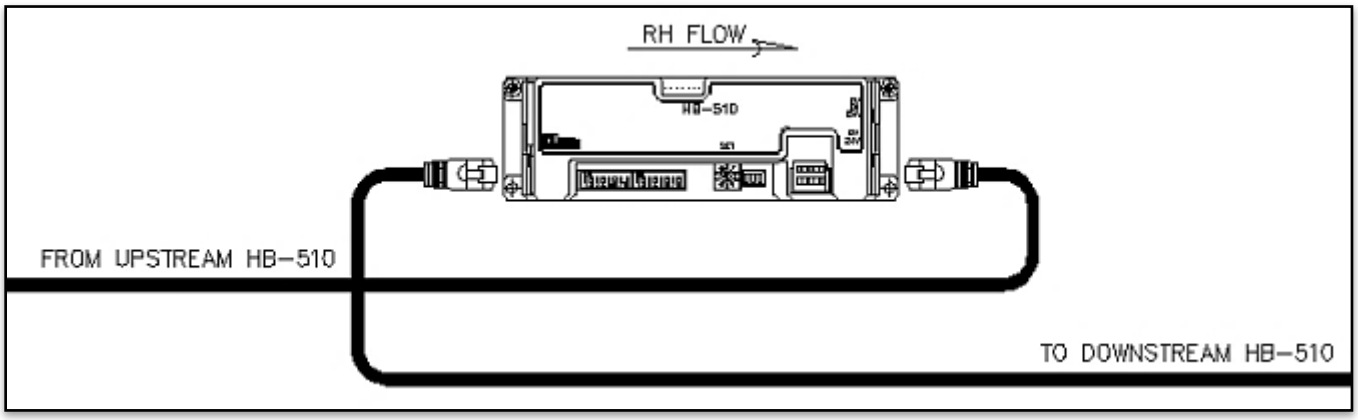
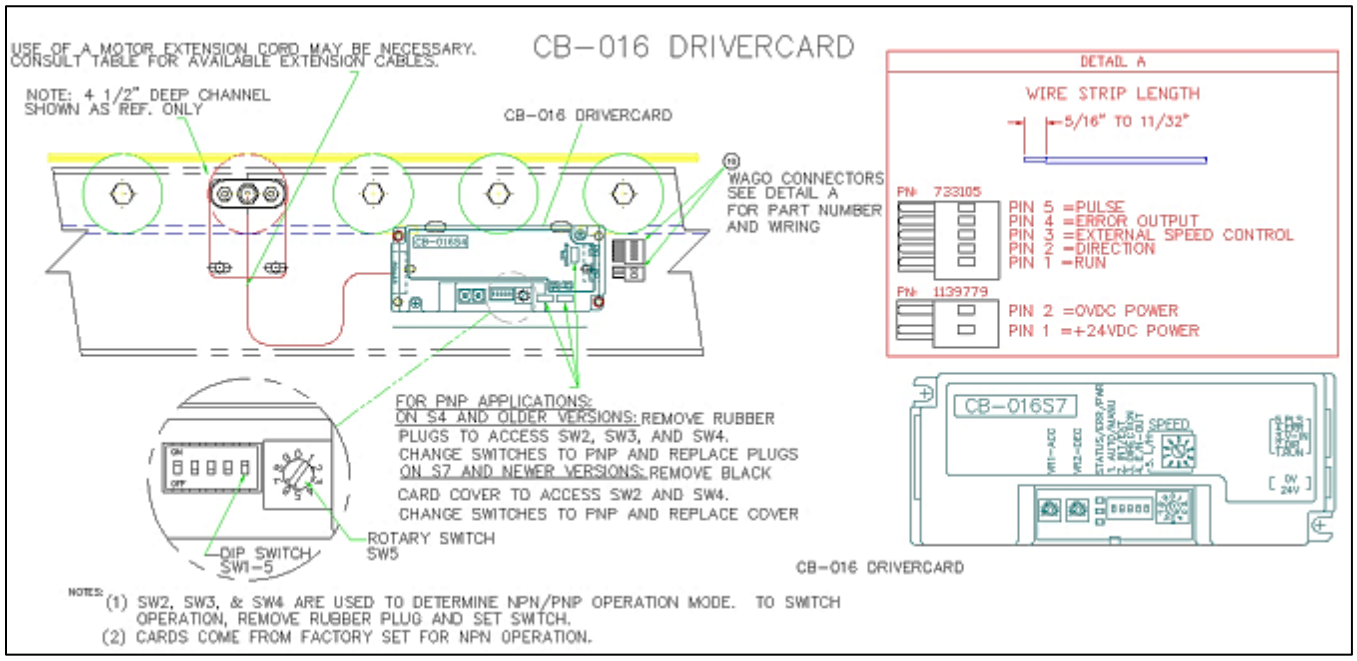


Figure 4 – HB-510 Communication Cable RH Flow

- Cat5E cable (Upstream cable goes in right side of card, and downstream cable comes out the left side of the card, RH generally requires a longer cable). See diagram below :

CB-016 Drivercard (Spurs) Speed Chart

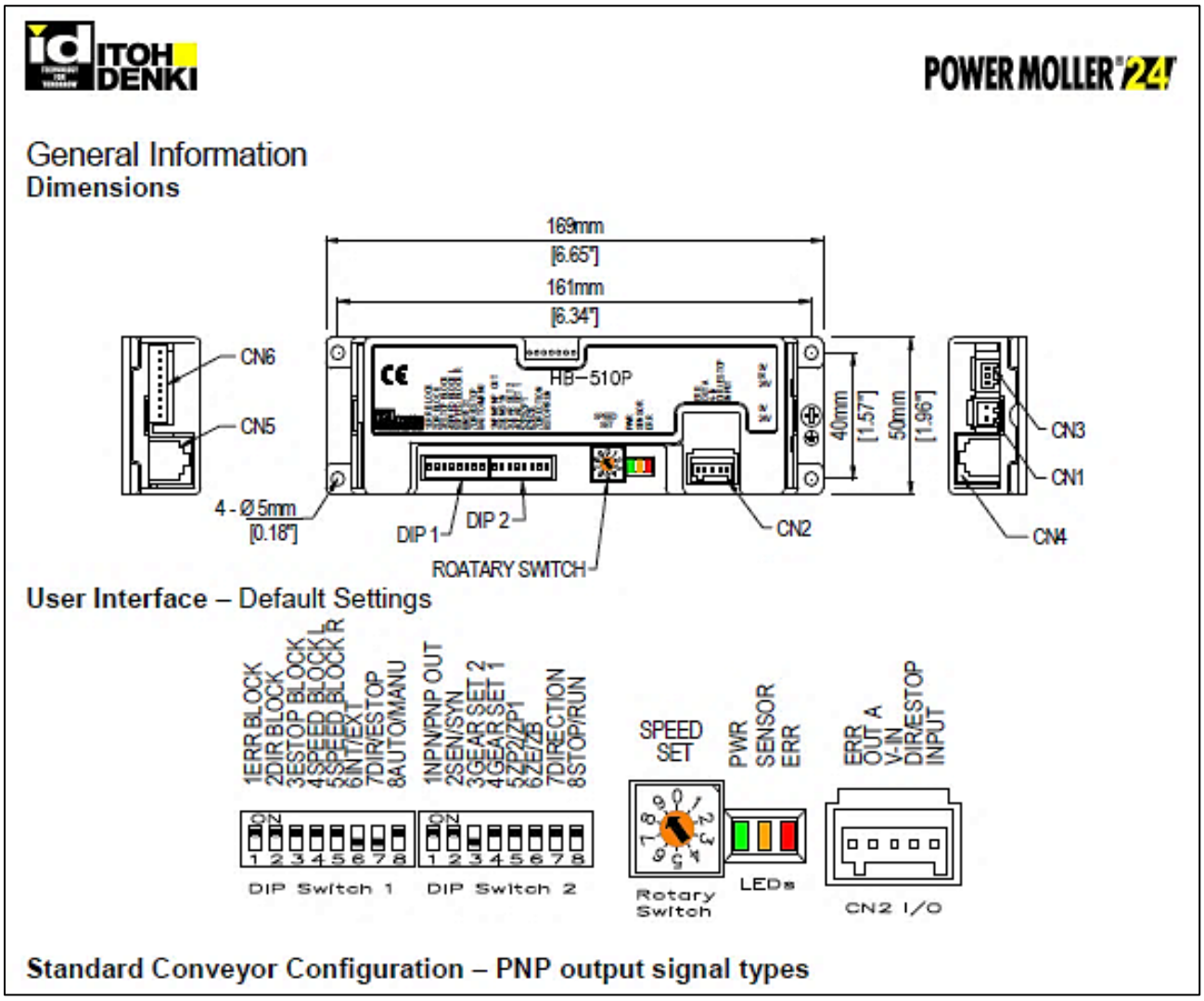


SPEED CHANGE TABLE

CB-016 DRIVERCARD

20 DISCREET SPEED CHANGE STEPS FOR INTERNAL CONTROL VIA DIP SWITCH AND ROTARY SWITCH		FP ROLLERS (FPM)			FE ROLLERS (FPM)			FS ROLLERS (FPM)	
DIP SW1-5	ROTARY SW5	100,140, 190,255	20,30, 45,55	5,8, 10,15	70,100,14 0180,210	20,30,45 55,60	5,8,10, 15,17	20,30, 45,55	5,8, 10,15
ON	9	971.9	214.1	56.8	698.9	197.5	55.4	214.1	56.8
ON	8	890.9	196.3	52.1	640.6	181.0	50.8	196.3	52.1
ON	7	850.4	187.3	49.7	611.5	172.8	48.5	187.3	49.7
ON	6	809.9	178.4	47.3	582.4	164.5	46.2	178.4	47.3
ON	5	769.4	169.5	45.0	553.3	156.3	43.9	169.5	45.0
ON	4	728.9	160.6	42.6	524.1	148.1	41.6	160.6	42.6
ON	3	647.9	142.7	37.9	465.9	131.6	36.9	142.7	37.9
ON	2	607.4	133.8	35.5	436.8	123.4	34.6	133.8	35.5
ON	1	566.9	124.9	33.1	407.6	115.2	32.3	124.9	33.1
ON	0	526.4	116.0	30.8	378.5	106.9	30.0	116.0	30.8
OFF	9	485.9	107.0	28.4	349.4	98.7	27.7	107.0	28.4
OFF	8	445.4	98.1	26.0	320.3	90.5	25.4	98.1	26.0
OFF	7	404.8	89.2	23.7	291.1	82.3	23.1	89.2	23.7
OFF	6	364.3	80.3	21.3	262.0	74.0	20.8	80.3	21.3
OFF	5	324.0	71.4	18.9	233.0	65.8	18.5	71.4	18.9
OFF	4	283.5	62.5	16.6	203.9	57.6	16.2	62.5	16.6
OFF	3	243.0	53.5	14.2	174.8	49.4	13.9	53.5	14.2
OFF	2	202.5	44.6	11.8	145.6	41.1	11.5	44.6	11.8
OFF	1	162.0	35.7	9.5	116.5	32.9	9.2	35.7	9.5
OFF	0	121.5	26.8	7.1	87.4	24.7	6.9	26.8	7.1

Controls Guidelines - Itoh Denki HB-510 Drivercard



General Notes:

- Local accumulation control with minimal higher level control system interface requirement (infeed zone, line full status, discharge zone). See Application Guideline section for details.
- TGW HB-510 conveyor (ITR^{HB}) includes:
  - Zone sensor – installed, connected, and pre-aligned to reflector.
  - Power harness – installed with taps to individual drivercards and bed-to-bed plug-in connections.
  - Drivercard – installed, connected to power harness and sensor, and speed pre-set.
  - Card-to-card communication cables (CAT5E) factory installed.
  - CN2 – 5-PIN connector installed in card.
  - Motorized rollers – installed in bed, motor cable connected.
  - All beds factory tested for PE alignment, flow direction, speed, and proper plug-in connections.

HB-510 Features:

- Built in thermal protection for both driver card and Power Moller
- Three LED's to identify type of error and number of occurrences
- Dynamic brake control
- Stable speed function to ensure articles of different weights travel at the same rate
- Variable speed control by rotary switch or by external voltage input for up to 10 speeds
- Direction control by onboard DIP switch or external signal input
- Logic for general zero pressure accumulation (ZPA) control is built in
- Direct connection for photo eye to both power it and receive its output signal
- Easy connection between adjacent HB-510's with CAT 5 communication cable to simplify wiring
- Flexible Zone Recognition (patented) to handle long articles which simultaneously block multiple sensors
- Also available for rollers with built-in brakes, HB-510B
- Compatible with Motorized Rollers PM486FS, PM486FE, PM486FP, PM570FE, PM605FE, PM635FS

HB-510 Specifications:

Operation:

- Cycle: 1 second ON; 1s OFF (max on-off cycles 30/minute)
- Continuous duty permissible
- If being fed by faster upstream equipment, do not exceed 150% of no-load operating speed (back EMF will be generated)
- Power: +24V DC +/-10% (full-wave rectified, smoothed current <10% ripple
- See “Connections” section for I/O circuit current limitations/requirements
- PNP circuitry for all I/O, except for CN2 outputs 2-4 & 2-5, which are configurable as PNP or NPN.

Protection:

- Thermal Overload 185°F (85°C) on PCB (Printed Circuit Board)
- Thermal Overload 221°F (105°C) in motor
- 5A Internal fuse (non-replaceable) to power supply
- Internal diode circuit protection (Voltage Polarity)

Environment:

- Ambient Temperature 32-104°F (0-40°C)
- <90% Relative Humidity (No condensation)
- No Corrosive Gases
- Vibration <0.5G

HB-510 Connections

CN1 – 2 PIN connector for Power	Male Connector on Card WAGO #734-162	Female Connector for Wiring WAGO #734-102

PIN	Description	
1	+24VDC +/-10% (full-wave rectified, smoothed current <10% ripple)	Wire Size: 28-14AWG
2	0V	

CN2 – (Included with Card) 5 PIN connector for external control	Male Connector on Card WAGO #733-335	Female Connector for Wiring WAGO #733-105

PIN	Description	
1	+24V DC (Input) – Release, Force Run, or Force Zone Stop	Wire Size: 28-20AWG
2	+24V DC (Input) – DIR/E-stop	
3	0-+10V DC (Input) – V-IN (Allows analog speed control, 1.6mA/card)	
4	+24V DC (Output) – OUT-A (Open collector: 25mA max)	
5	+24V DC (Output) – ERR (Open collector: 25mA max)	

CN3 – 3 PIN connector for Sensor	Male Connector on Card WAGO #733-363	Female Connector for Wiring WAGO #733-103

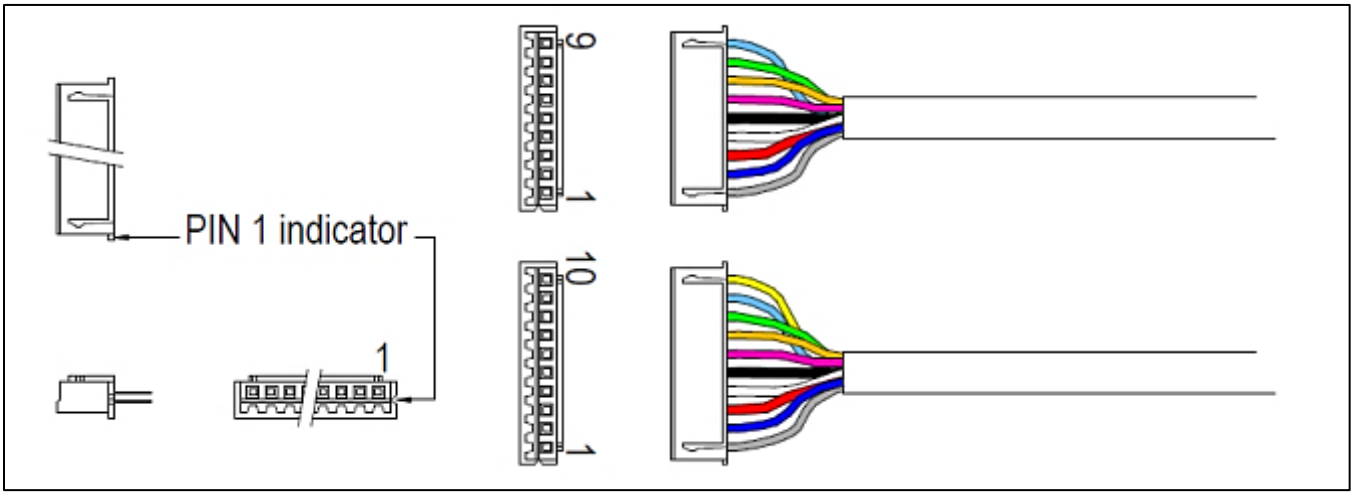
PIN	Description	
1	+24V DC (Power supply to Sensor)	Wire Size: 28-20AWG
2	+24V DC (sensor signal input) – Dark Operate PNP sensor	
3	0V	

CN4 & CN5 – Control Interconnect

- CAT5E cable connection is for card to card signaling only, is not a network, and does not follow Ethernet PIN order.
- See Itoh Denki for additional information on CN 4 & 5 pin outs, as well as information for interfacing HB-510 drivercards with previous generation cards (HB-508).

CN6 – 9 or 10 PIN connector for Motor (10 PIN for brake roller)	**Male Connector on Card JST #S9B-XH-A (S10B if brake)**	**Female Connector for Wiring JST #XHP-9 (-10 if brake)**

PIN	**Description**	
1	GND - Grey	Wire Size: 28-22AWG & 24-22AWG motor phases Terminal pins: JST #SXH-001T-P0.6
2	+12V DC – Blue	
3	Motor Phase U – Red	
4	Motor Phase V – White	
5	Motor Phase W – Black	
6	Hall Sensor U – Violet	
7	Hall Sensor V – Orange	
8	Hall Sensor W – Green	
9	Thermistor – Light Blue	
10	Brake - Yellow	



HB-510 Installation Precautions

Precaution	Action	Reason
More than 30 cards connected together with the CAT5E communication cable	The first card after each set of 30* must be set as follows: DIP Switch 1-1: OFF DIP Switch 1-2: OFF DIP Switch 1-3: OFF *Standard conveyor configuration; starting with first upstream card. If using ERR, DIR or ESTOP, signal must be connected to each group of 30 cards.	When a card has it ERR, DIR or ESTOP signal activated, that signal is communicated through the CAT5E cable by sinking the signal. Each card's circuitry must be able to handle the current sourced by other cards on the chain. More than 30 cards will exceed the current limit and damage the printed circuit boards.
Powering ON	Maintain safe distance from the system when powering on, as equipment will start automatically.	When the system is first powered on, a 5-7 second startup cycle will initiate. Unoccupied zones will run at a slow speed to advance articles which may be between photo-sensors (Seek to Sensor function). After this, occupied zones will start running if there are open downstream sensors.
Low impedance connection to PNP output(s)	DO NOT connect an output terminal (CN2-4, CN2-5) set for PNP directly to 0V, GND, or a low impedance input on a controller.	When the PNP signal is active, the low impedance input will draw a high current, potentially damaging both the drivercard and the controller.
Multiple power supplies	0V line of all power supplies associated with a conveyor "unit" (cards, rollers, and external controls) need to be connected.	This completes the signal path between conveyor sections and system controls.
Voltage drop across power bus	Use suitable gauge wire in relation to distance and current draw.	Voltage must not drop below 21.6V DC or voltage faults will occur.

HB-510 User Interface Switch Settings

Signal Block Settings						
DIP Switch	**Function**	**On**		**Off**		**Default Setting**
		CN5 (Left)	**CN4 (Right)**	**CN5 (Left)**	**CN4 (Right)**	
1-1	ERR signal transmission	Transmit & Receive	Transmit & Receive	Transmit & Receive	Blocked	**ON**
1-2	DIR signal transmission				Blocked	**ON**
1-3	ESTOP signal transmission				Blocked	**ON**
1-4	SPEED signal transmission Left (Downstream)		n/a	Blocked	n/a	**ON**
1-5	SPEED signal transmission Right (Upstream)	n/a	Transmit & Receive	n/a	Blocked	**ON**

Input / Output Settings				
DIP Switch	**Function**	**ON**	**OFF**	**Default Setting**
1-6	SPEED adjustment	External: 0-10V DC	Internal: Rotary switch	**OFF**
1-7	DIR or ESTOP input (CN2-2)	ESTOP signal input	DIR signal input	**OFF**
1-8	Reset for thermal recovery	Manual input recover	Automatic recover	**ON**
2-1	Output signal type (CN2-4 & CN2-5)	PNP signal output	NPN signal output	**ON****
2-2	Sensor or Synchronous output (CN2-4)	Output is active (+24V) while internal motor RUN signal is ON.	Output is active (+24V) while photo-sensor (CN3-2) signal is ON.	**ON**
2-8	STOP or RUN input (CN2-1)	RUN signal input	STOP signal input	**ON**

Timer Settings – Allows card timers to be adjusted for fast (single stage) down to slow (three stage) rollers, default setting is for two stage. Also can be used to lengthen run timers for long (>36") zones.

Dip Switch		**Gear Stages**	**Time (seconds)**		
2-3	2-4		**Sensor Timer**	**Run Hold Timer**	**Jam Timer**
OFF	OFF	1	0.3-1.2	0.3-1.2	0.6-2.2
OFF (Default)	**ON (Default)**	**2**	1.0-4.0	1.0-4.0	2.0-8.0
ON	OFF	3	4.0-14.0	4.0-14.0	7.5-27.0
ON	ON	n/a	Motor runs continuously; for trouble shooting only		

Other Settings				
DIP Switch	**Function**	**ON**	**OFF**	**Default Setting**
2-5	Release modes	ZP1 Train/Slug release	ZP2 Singulated release	**ON**
2-6	Last zone mode	ZB	ZE	**ON**

		Standard zone		Last (discharge) zone		
2-7	Motor direction*	FE	FS/FP	FE	FS/FP	**ON**
		CCW	CW	CW	CCW	

*Motor direction (as viewed from the cable side; PM486 series) is independent of ZPA logic flow direction.

Notes:

- Table based on PM486FE-60 roller
- See Roller Performance Tables for additional card/roller speed combinations
- When using an analog signal for external speed control, note that roller speed selections are in fixed increments and not infinitely adjustable

HB-510 LED's and Error Indications

Status	LED1 (green)	LED2 (orange)	LED3 (red)	ERR Signal (CN2-5)	Error Condition	Result	Solution*
Normal	● (ON) Blinks (1Hz) ● ○ while running		○ (OFF)	● (ON)	n/a	n/a	n/a
Thermal overload	● (ON)	● (ON) When sensor signal is ON	● (ON)	○ (OFF)	Motor or PCB above operating temperature	No operation	1
Motor lock			Blinks (1Hz) ● ○	● (ON)	Motor locked (>4s)		2
Motor unplugged			● (ON)	○ (OFF)	Motor not connected to card		3
JAM error		Blinks (1Hz) ● ○	○ (OFF)		Jam Timer activated		4
Open fuse Low voltage	○ (OFF)	● (ON) When sensor signal is ON	Blinks (1Hz) ● ○		Low voltage or current exceeded 5A		5
Current limit	Blinks (1Hz) ● ○ while running		Blinks (6Hz) ●○●○●○ ●○●○●○	● (ON)	High current draw	n/a	6

Solution

1. See more information under Input / Output Settings, DIP switch 1-8
   - A signal applied to CN2-1 (INPUT) will reset this error status
   - Thermal overload can only be reset if the temperature has fallen back into the operating range
2. Remove the cause of the motor lock and clear the zone
   - A signal applied to CN2-1 (INPUT) AND DIP switch 2-8 set to ON (RUN) will reset this error status
3. Remove power from the card, plug in the motor connector, and then reapply power
4. Remove the cause of the jam and clear the zone
   - A signal applied to CN2-1 (INPUT) will reset this error status
   - As long as a signal is applied to CN2-1, jam error status will not turn ON
5. Replace the card
6. Not usually a cause for concern, unless it is occurring frequently over the entire running cycle

TGW Nominal Speed Chart:

HB-510 DRIVERCARD / FP- _ _ _ ROLLER

ROLLER: FE-17

TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
13	0	13.8
18	1	18.4
20	2	23
25	3	27.6
30	4	32.5
35	5	37.1
40	6	41.7
45	7	46.3
50	8	50.9/(49.9)
	9	55.3/(49.9)

ROLLER: FE-60

TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
45	0	49.2
65	1	65.6
80	2	82
95	3	98.4
110	4	114.8
130	5	131.2
145	6	147.6
160	7	164
180	8	180.4/(176.8)
	9	196.8/(176.8)

ROLLER: FE-100

TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
170	0	174.8
230	1	232.9
	2	290.3/(239.4)
	3	349.3/(239.4)
	4	
	5	
235	6	407.4/(239.4)
	7	
	8	
	9	

ROLLER: FE-140

TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
170	0	174.9
230	1	233.2
290	2	291.4
345	3	349.7
405	4	408.2
	5	466.3/(419.8)
	6	524.7(419.8)
415	7	
	8	566.2/(419.8)
	9	

Note: Speed with two numbers are " NO-LOAD / RATED". Rated numbers are what the roller is capable of doing under a continuous duty full load condition.

HB-510 DRIVERCARD / FP- _ _ _ ROLLER

ROLLER: FP-55

TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
50	0	53.5
70	1	71.2
85	2	88.9
105	3	106.9
120	4	124.6
140	5	142.4
160	6	160.4
175	7	178.1
180	8	195.8/(181.1)
	9	204.3/(181.4)

ROLLER: FP-100

TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
240	0	243
	1	324.1/(259.1)
	2	
	3	
	4	
255	5	404.8/(259.1)
	6	
	7	
	8	
	9	

ROLLER: FP-140

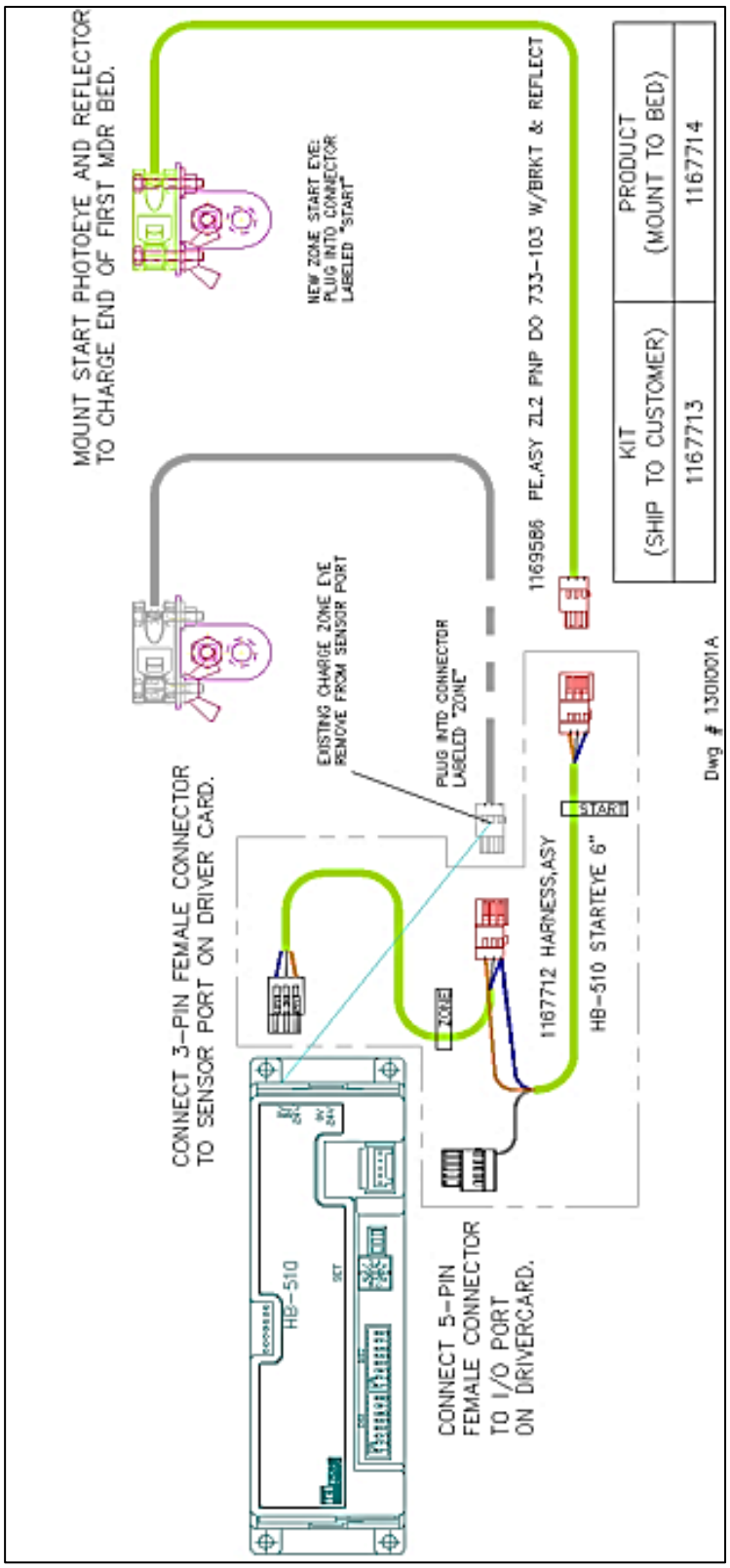
TGW NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ± 5% (fpm)
240	0	243.4
320	1	324.5
405	2	405.4
	3	486.6/(478.2)
	4	567.7/(478.2)
	5	
475	6	
	7	627.1/(478.2)
	8	
	9	

Note: Speed with two numbers are " NO-LOAD / RATED". Rated numbers are what the roller is capable of doing under a continuous duty full load condition.

ITR^{HB} General Information

See Itoh-Denki technical document for additional information: http://itohdenki.com/

HB-510 Start Kit



Photoeye Cable Kit