



STANDARD OPERATING PROCEDURE

Ref:	SOP-0213-01B-N-DEV
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Description:	FS5 Starpoint Technical Information
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FS5 RM FLEXI – STRIP Technical Information

**PLEASE NOTE THAT THIS PACK IS INCOMPLETE
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Contents

	SUBJECT	Page No:
	Introduction	
		5
	Conditions of Use	
1	Temperature Range	6
2	Humidity	6
3	Continuous use	6
4	Operational Environment	6
5	Operational Life	6
6	Installation	6
7	Handling	7
8	Reel band Construction	7
9	Warranty	7
	Mechanical Specifications	
1	General	8
2	Drive Gear	8
3	Reel Band Position	8
	Electrical Specifications	
1	General	9
2	Electrical Connections	9
3	Stepper Motor	9
4	Control Circuits with Drive Transistors B965 & 20015	9
5	Motor Phasing	9
6	Position Control Sensor	10
7	Service Facility	10
8	Band Illumination	10
9	Band Drive	10
10	Running Conditions	11
11	Standstill Conditions	11
12-a	Motor Drive Software – Reset Procedure	11
12-b	Motor Drive Software – Optic Tab Monitoring During Rotation	12
	Adjustment and Calibration	
		13
	Ordering Information	
		14
	Packaging	
		16
	Appendix	
A	Ramp Tables	17
B	Specification Sheet	18
C	Timing Diagram	19
	Drawings & Specification Sheets	
	General Assembly Drawing	20
	Loom Drawing	21
	Circuit Diagram	22
	Band Details	23
	Motor Drawing	24

INTRODUCTION

The FS5 Flexi-strip mechanism is designed to provide the games designer with the ability to present the impression of a flat-faced reel mechanism for use in shelf or glass mounted applications. It utilises the already proven technology of the Starpoint family of Flexi –Strips. Being of modular design the unit allows for a greatly increased visually projected display area. The drive is achieved through a standard NMB motor with the positional accuracy achieved an optic device. The unit is capable of being mounted directly onto the play glass thus eliminating the need for expensive internal bracket arrangement. The unit can be supplied with or without the drive PCB, and can be fitted with an option of coloured lamps, to provide enhanced visual illumination of symbols.

CONDITIONS OF USE

1. Temperature Range

The Mechanism will operate satisfactorily in the temperature range 0°C to 50°C provided there is an unrestricted airflow and proper motor control is exercised

2. Humidity

The unit will operate in the range of 0% to 95% - relative humidity.

3. Continuous use

There is no practical limit to continuous use assuming normal motor temperature control procedures are followed. It is expected that normal operation is a minimum 12-hour day.

4. Operational Environment

It is recommended that the unit is not operated in an exposed environment if the public are present. The most suitable method of operation should be behind a glass or screen.

5. Operational Life

The units have been subjected to various accelerated life tests and a minimum operational life of one million cycles is assumed.

6. Installation

The FS5 mechanism is mounted to the cabinet via 4 off 5.1 mm diameter holes located on the side plates.

7. Handling

Whilst the FS5 RM is of a robust construction care must be taken when removing or adding the band, to ensure that no damage occurs to the rollers, drive mechanism or optic device

It is not recommended that the power connection be installed or removed from the unit while the Host Machine is powered up. Failure to switch off power will most likely result in damage to the devices in the unit.

8. Band Construction

Details of the unit's band sizes and symbol pitches can be found in Drawing Number F3C064-01-ZZZZ

9. Warranty

A guarantee of twelve months from the shipment date is available for the reel mechanism, subject to Starpoint's standard terms and conditions. This guarantee is offered irrespective of the number of operations of the unit during this period but subject to operation within the environmental conditions specified above. A unit, which may require return under the guarantee, should be returned direct to Starpoint or your local distributor.

MECHANICAL SPECIFICATION

1. General

The FS5 unit is built to the dimensions shown in the General Assembly Drawing number G4G014-01-ZZZZ and will operate in any orientation.

2. Drive Gear

The drive mechanism is provided by a high power 48 Step 12v NMB motor. The band containing the symbols is driven from a toothed roller that is in turn rotated from the motor via the drive gear assembly. The total output ratio is 5.33 : 1 with 16 symbols on the band this equates to 16 steps per symbol and 256 steps per revolution. To compensate for the harsh start and stop effect on the band the motor cross pin has been fitted with the Patented 'o' ring drive technique. This both softens the drive effect and significantly reduces the wear to all parts of the drive mechanism.

3. Band Position

The relationship between the motor drive, optic detection and the reel band is unique. This allows the reel band to be fitted without adjustment or specific positioning on the drive rollers

ELECTRICAL SPECIFICATION

1. General

All electrical parts are contained on the printed circuit board or connected to it for Interfacing to the user interface. The P.C.B. is located within the unit.

2. Electrical Connections

Connections to the motor and position control sensor are contained on the P.C.B. as Illustrated in Circuit Diagram G5D018-01-ZZZZ

3. Stepper Motor

The Motor is a 12V 48 Step, 10 ? per phase 1.2 amps. The part number is PM55L-048-SRB7 as in drawing no A1C005-02-ZZZZ. The supplying company is NMB of Japan.

4. Control Circuits with Drive Transistors

12v DC is the reference line for the four PNP drive transistors that control the motor windings. In this case the motor commons are connected to the OV power line. A minimum drive signal of 12v DC capable of sinking a base current of 50 mA is required.

This system enables the unit to be driven from the same hardware that would normally drive standard reel mechanism's, i.e., when the external NPN drive transistor is on the motor winding is energised.

5. Motor Phasing

The FS5 is phased to the master position on the Black and Yellow windings. Note that when interface circuits are used the phasing must be done through the board as under these conditions motor winding currents are reversed in direction. This will make no difference to the running and direction of the motor from normal drive sequences

6. Position Control Sensor

The optic tab is printed onto the band. Interrogating this is the position control sensor, A self-contained photo optic sub assembly from Temic (AEG Telefunken). The manufacturers part number is TCYS5201. The sub-assembly is complete with a built in Schmitt trigger and open collector output. A high level denotes that the optic beam is interrupted. The open collector output is capable of sinking 10 ma and a pull up resistor is therefore required at the user end.

7. Service Facility

The P.C.B. contains a red L.E.D. which is a service facility to indicate correct operation of the photo sensor and tab position. The L.E.D. is normally illuminated and will go off when the optic is interrupted. The L.E.D. is type TLUR44 from Temic (AEG Telefunken).

8. Band Illumination

22 off lamps (coloured or clear) are fitted to a plastic vac form moulding using the Starpoint 5mm lamp Holder (Part number B9S013-01-ZZZZ). The lamps are configured in a 6x4 matrix to provide for individual or multiple lamp illumination. Refer to the loom drawing A3C101-01-ZZZZ for wiring details.

9. Band Drive

The band containing the symbols is driven from a toothed roller that is in turn rotated from the motor via the drive gear assembly. The total output ratio is 5.33 :1 with 16 symbols on the band this equates to 16 steps per symbol and 256 steps per revolution. The system has been designed to facilitate the fitting of the band in any sprocket position, i.e., at the appropriate position the optic tab will be centralised in the optic device at the phased motor step.

10. Running Conditions

All ramp and control information assume the motor is warm and that the voltage rails are within 10 % of their nominal value. Ramp Tables are contained in Appendix A and a typical Timing Diagram is contained in Appendix C.

11. Unit Standstill Conditions

Due to the low resistance of the motor winding it is necessary to turn off all phases at standstill to assist in keeping the motor temperature as low as possible. It is also recommended that the stop times between spins are at least four times the spin time to assist temperature control. This will ensure that the motor operates at its optimum and therefore maximum torque is available. Please note that this is a valid condition because due to the drive ratio of the system the bands are not liable to move position under no power input situation.

12. Motor Drive Software

A) Reset Procedure

This procedure is recommended at power on or on occasion when the software identifies that the band is out of step or in an incorrect position.

1. Drive the motor at approximately 50 R.P.M.
2. At every motor step change, monitor the optic output. Immediately the tab is detected by the optic cease driving the motor.
3. Wait 500 ms then power up the motor on the black and yellow windings.
4. Wait 500 ms this allows the motor / band to settle in position. Check that the tab is central in the optic device. If it is not then repeat steps 1 – 4, if the tab is still not in the optic then this would indicate that there is a fault.
5. The mechanism and software are now initialised.
6. Now enter either the standstill mode or resume the game in play, which ever is appropriate.

B) **Optic Tab Monitoring During Rotation**

During reel spin or game play it is important to monitor the optic tab to confirm it is at the expected position. This can be achieved during rotation as long as a window is set around the time the tab is expected to be seen. This window is to allow for ramping up or down of the motor and variation in operational spin speeds. To confirm the band is in synchronisation carry out the following tests in software.

1. When the band is to stop on the master symbol ensure the step sequence stops with the black and yellow windings energised and the optic tab will be in the optic device. If the tab is not central in the optic device then re apply the reset procedure.
2. To monitor the optic device during rotation create a window of 6 motor steps, within which the optic tab should interrupt the optic. This window is dependant on users software and may need development to an optimum size. If difficulty is experienced with this monitoring please contact Starpoint Electrics on +44 (0) 20 8931 7700

ADJUSTMENT AND CALIBRATION

The FS5 construction is such that only one adjustment is available and this is to adjust the phase setting of the motor. It is necessary for the motor to be phase set so that the reel band symbols are always correctly presented to the player. The units are factory set prior to delivery.

The stepper motor has a cross pin in the shaft which is used to ensure consistent drive of the mechanism. This pin must be aligned to the optic sensor and this adjustment is called the Phase Setting Adjustment.

Motor Phase Setting

This adjustment may be necessary when due to exceptional circumstances the motor requires replacement or due to mishandling the drive gear has become disengaged.

Tools required: - Crosshead Screwdriver
12v D.C. 2.5 A Power Supply

Method

- i) Loosen 2 motor facing screws on the side plate.
- ii) With the mechanism assembled complete with band fitted, move the band until tab is near to optic, and connect as follows:
 - a] For drive CCTS fitted - pin 12 to +12v supply pins, 7,8,10 and to OV
 - b] For drive CCTS not fitted - pin 12 to +12v supply pins 8 and 10 to OV
- iii) Turn power on, the reel band will jump to the motor phased position.
- iv) Rotate motor housing until tab is central in the optic.
- v) Tighten 2 motor fixing screws on the side plate.
- vi) Turn power off.

To check phase setting is correct

- a] Rotate band so tab is just out of optic.
- b] Turn power on and tab should jump to a position central to the optic device.
- c] Turn off and disconnect power supply.



ORDERING INFORMATION

The production build standard for the FS5 is defined in the specification sheet shown in Appendix B. It is most important to complete the specification sheet when ordering. If difficulty is experienced in completing the sheet, assistance can be obtained by contacting Starpoint on +44 (0) 20 8391 7700.

The following deals with each section in order down the specification sheet.

CUSTOMER

Complete the purchasing Company's name.

CUSTOMER PART NUMBER

Enter the Customer part number as this will be cross-referred to the Configuration / Specification Number. Both numbers are included on the order and invoice documents.

DATE

Complete the date specification sheet is completed.

QUOTATION REQUIRED – Please indicate by deleting either the YES or NO if a formal quotation is required.

QUANTITY REQUIRED – If a quotation is required, please add the qty to the box.

COMMENTS

An area is available to highlight any special instructions.

MECHANISM TYPE

This is pre-defined. BN refers to FS5.

P.C.B.

There is 1 type available, with drivers = 37

ORDERING INFORMATION – Cont'd

LOOM

There are 2 Lamp options

24 Lamp Loom = A

22 Lamp Loom = B

BULBS

The standard configuration is all clear bulbs = AA

For an alternative arrangement to this there is a choice of Clear, Yellow, Green, Blue and Red. Write in the numbered box the choice of colour required for each lamp position, referring to the diagram for the numbered positions, (Noting the orientation of the vac form).

BAND

There are 3 band choices available: -

- 1) No band fitted = ZZ
- 2) Clear Band fitted = 01
- 3) Or a customer specific band fitted. In this case contact Starpoint Electrics to discuss your requirements so that an identity can be created.



PACKAGING

All Starpoint FS5 mechanisms are wrapped in protective bubble-wrap and in turn into a protective Starpoint cardboard box to a maximum of four units per box.

APPENDIX A

Recommended Ramp Tables

All values in milliseconds and are the delays between phase changes.

33 R.P.M.

UP	14 – 12 – 10
RUN	7
DOWN	10 – 12 – 14

47 R.P.M.

UP	12 – 10 – 8
RUN	5
DOWN	8 - 10

NOTE :-

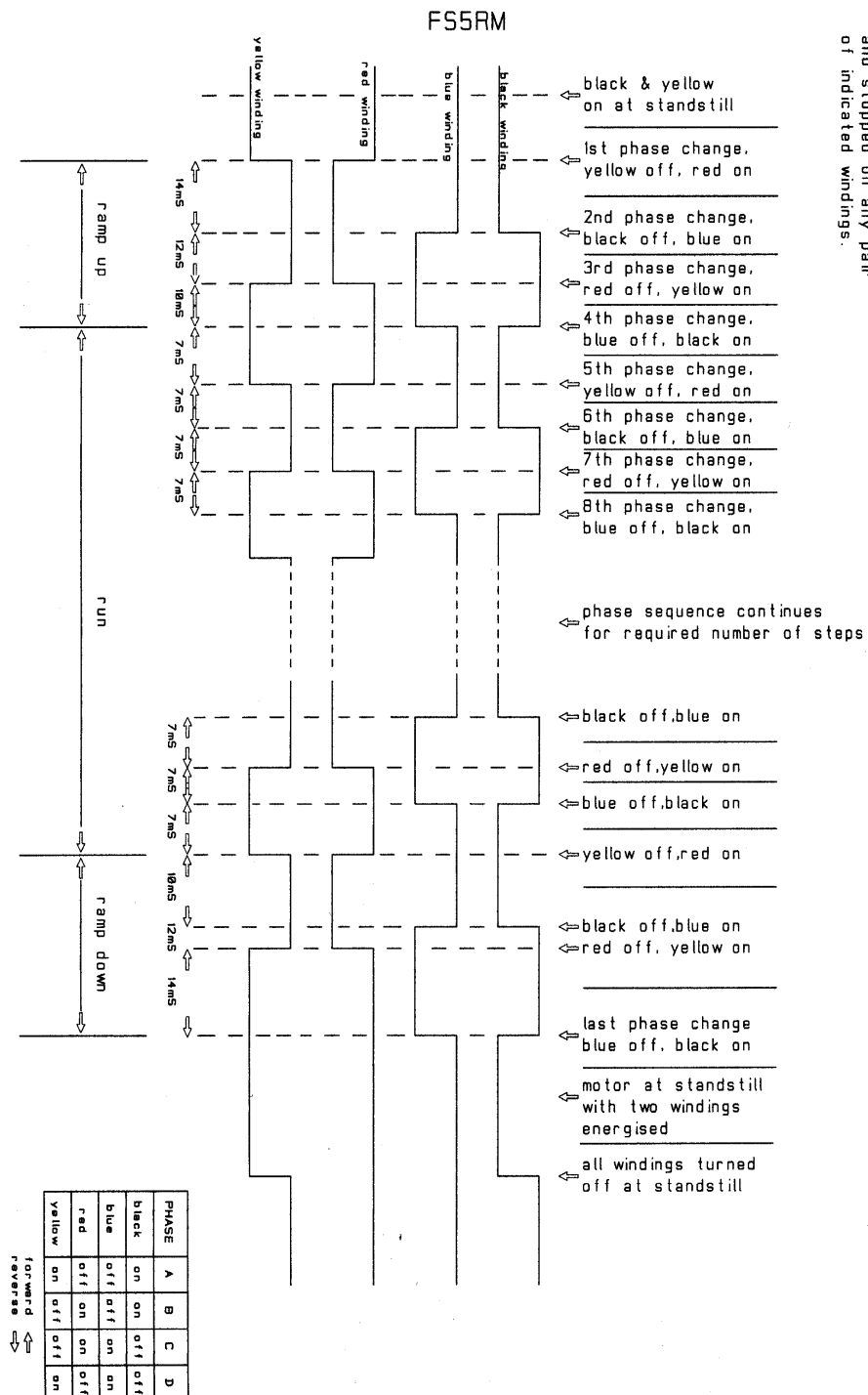
Examples of Ramp Tables to drive the mechanism at the different speeds are shown above. These Ramp Tables are nominal values, which should be optimised to meet individual requirements with regard to mechanism drive characteristics, such as soft stop or sharp stop of the band. To obtain the required effect the Ramp Tables may require some modification.

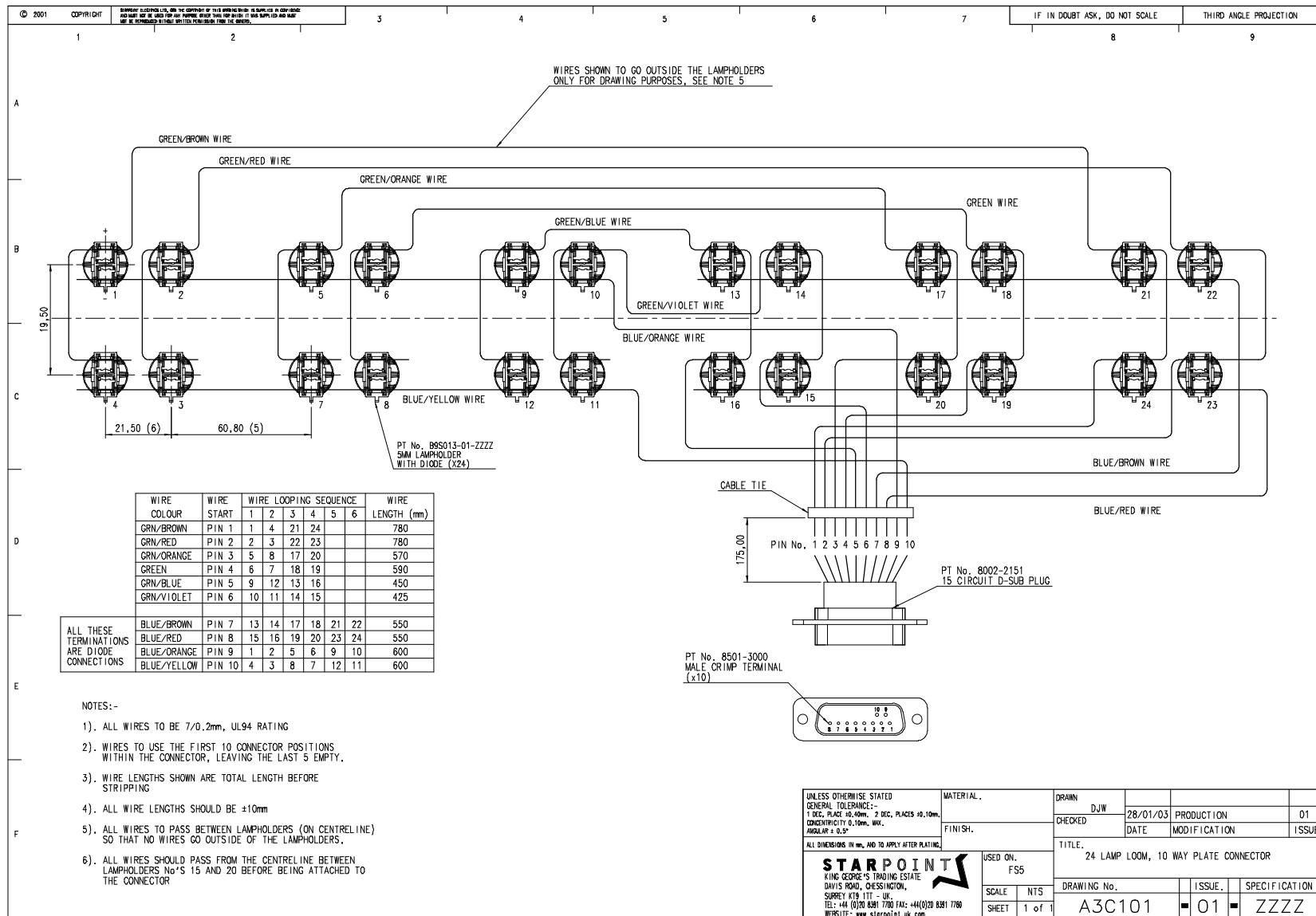
APPENDIX B – Spec sheet

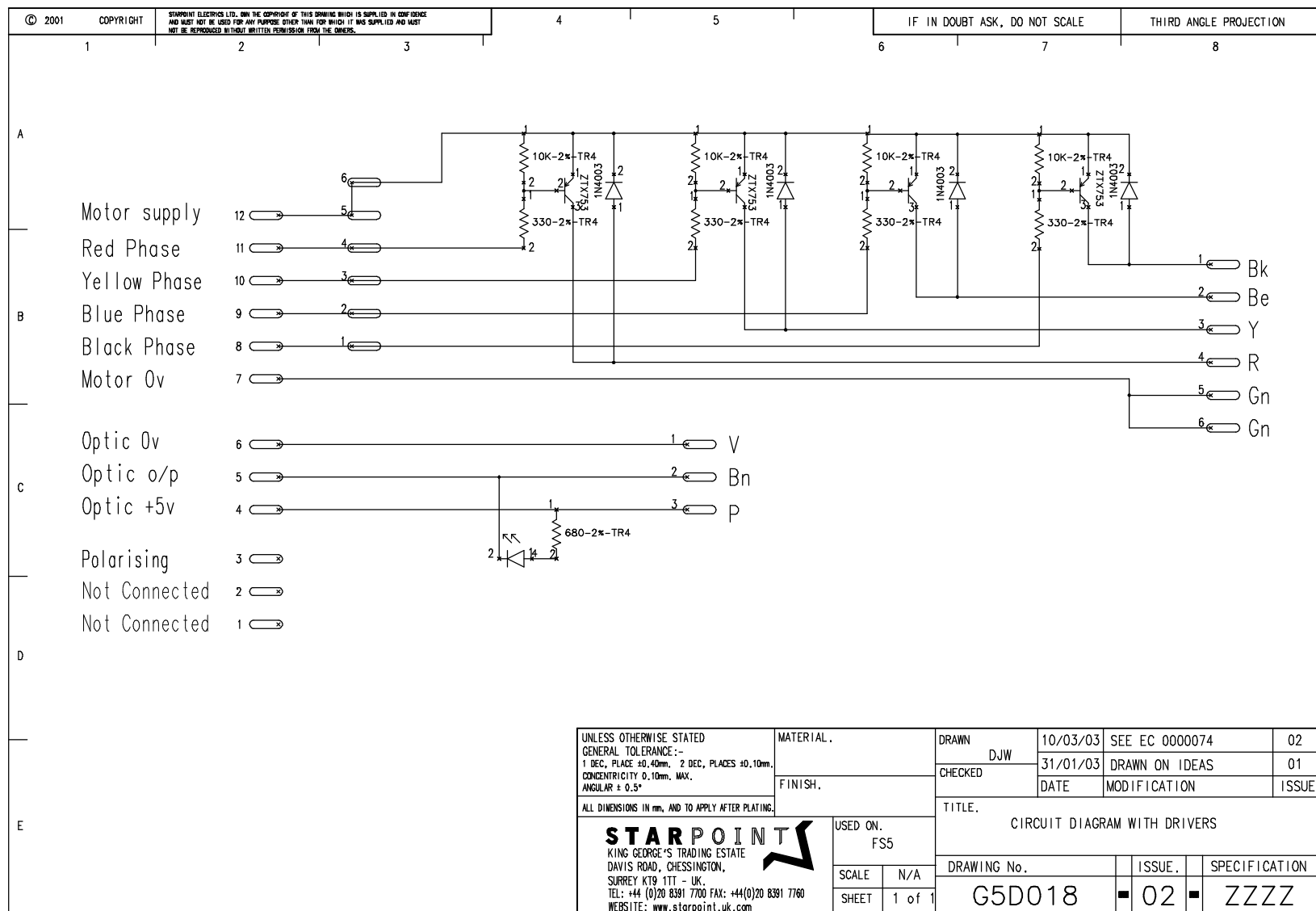
This is to be updated shortly

APPENDIX C

TIMING DIAGRAM







UNLESS OTHERWISE STATED GENERAL TOLERANCE :- 1 DEC. PLACE ±0.40mm. 2 DEC. PLACES ±0.10mm. CONCENTRICITY 0.10mm. MAX. ANGULAR ± 0.5° ALL DIMENSIONS IN mm. AND TO APPLY AFTER PLATING.	MATERIAL.		DRAWN	10/03/03	SEE EC 0000074	02		
	FINISH.		DJW	31/01/03	DRAWN ON IDEAS	01		
			CHECKED	DATE	MODIFICATION	ISSUE		
	TITLE.		CIRCUIT DIAGRAM WITH DRIVERS					
<div>STARPOINT</div> <div>KING GEORGE'S TRADING ESTATE DAVIS ROAD, CHESSINGTON, SURREY KT9 1TT - UK. TEL: +44 (0)20 8391 7700 FAX: +44(0)20 8391 7760 WEBSITE: www.starpoint.uk.com</div>	USED ON. FS5		DRAWING No.			ISSUE.	SPECIFICATION	
	SCALE	N/A	G5D018			02	ZZZZ	
	SHEET	1 of 1						

