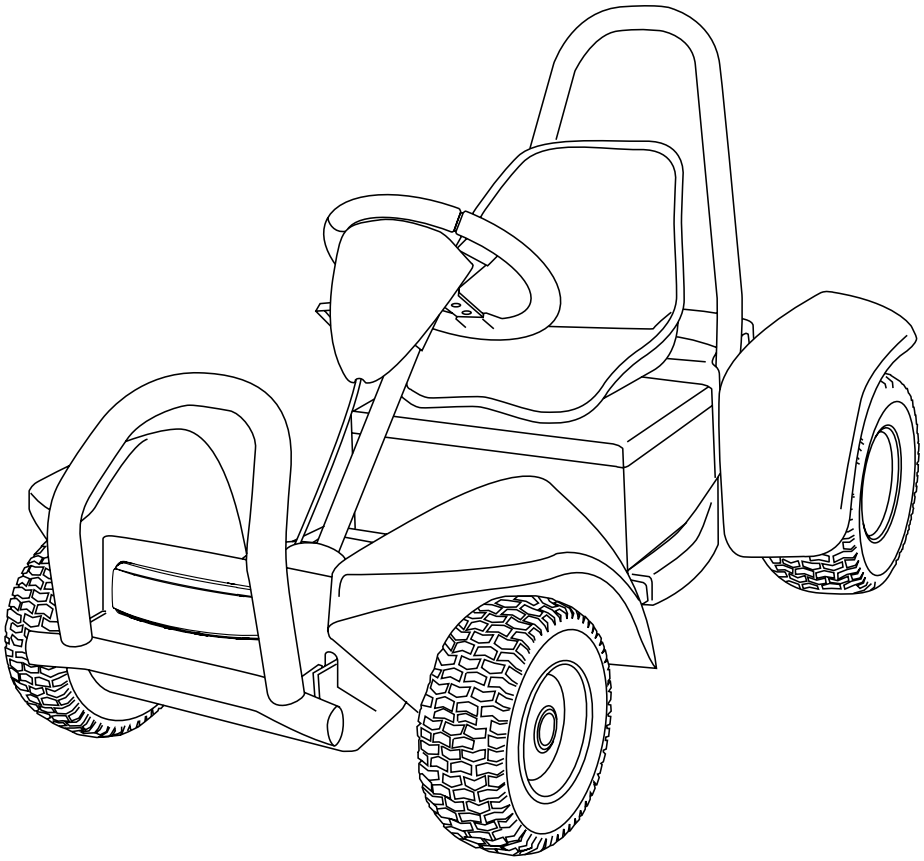
RAPTOR



Servicemanual

handicare

Handicare Produksjon AS
Serviceboks - 2626 Lillehammer - Norway

Servicemanual Handicare Raptor.

Innholdsfortegnelse Side

Innledning

Denne servicemanualen er beregnet for teknisk personell som skal utføre service på Handicare Raptor.

Servicemanualen er et tillegg til Raptor Brukermanual og Raptor Delekatalog. Det som står i Raptor Brukermanual vil i minst mulig grad bli gjentatt her.

Det er andre dokumenter som også kan være aktuelle ved service og vedlikehold, slik som monteringsanvisninger etc.

Raptor er konstruert og produsert etter Handicares spesifikasjoner.

For å sikre optimal ytelse og unngå ulykker må modifikasjoner ikke utføres uten at dette er godkjent av Handicare.

Elektronikken er forseglet. Hvis forseglingen brytes vil Handicare frasi seg et hvert ansvar i forhold til brukerens og produktets sikkerhet. Alt arbeid som innbefatter hele eller deler av elektronikken skal alltid utføres av personell som er autorisert av Handicare til dette.

Bruk under forhold eller til formål stolen ikke er konstruert for må unngås.

Alle illustrasjoner, informasjon og tekniske spesifikasjoner i denne manualen er basert på det sist tilgjengelige ved utgivelsen.

Handicare forbeholder seg retten til å gjøre endringer på spesifikasjoner og utstyr under den pågående produksjon uten varsel.

Hvis du har innspill til denne manualen, ting du savner og gjerne vil ha med, så vil vi gjerne vite om det.

Finner du feil i manualen så setter vi pris på om du rapporterer inn dette også.

Send en e-post til: dokument-hcp@handicare.no

Reservedeler

Bestilling av deler skal fortrinnsvis skje via Axapta/nettet, men ordretelefonen kan også brukes (69 24 44 00).

Delekatalogen for Raptor er tilgjengelig på nettet (Internett) og kan bestilles fra Handicare. Kontakt din Handicare avdeling hvis du har behov for denne.

Du skal/bør oppgi serienummer på Raptor når du bestiller deler.

Teknisk support

Har du tekniske problemer som ikke lar seg løse ved hjelp av denne manualen og eventuelle underliggende tekniske dokumenter som den tekniske dokumentasjonen for kontroller (regulator) så tar du kontakt med servicesenteret på telefon …

Resirkulering

De fleste HMS (hjelpemiddelsentraler) har avtaler med hensyn på resirkulering. Dette er noe du kan få nærmere informasjon om hos din lokale HMS.

Garantier

Informasjon om garantier finner du i ”*Brukermanualen*”.

Bruk og daglig vedlikehold

Informasjon om bruk og daglig vedlikehold finner du i ”*Brukermanualen*”.

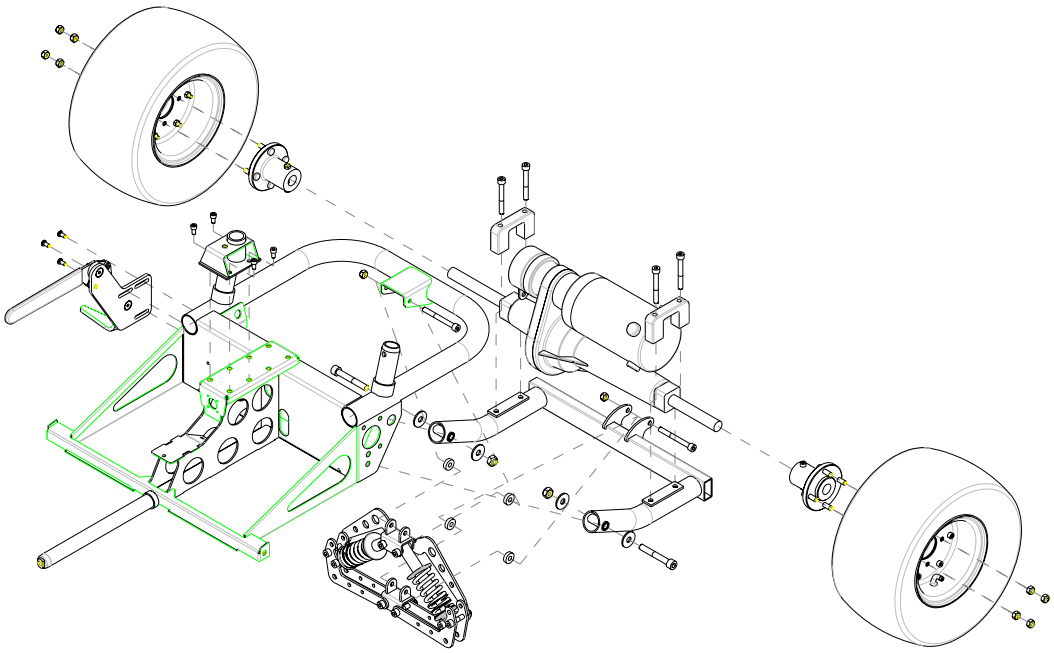
Handicare Raptor

Hovedkomponenter

Raptor er bygd opp modulært. I dette kapitlet vil vi ta for oss selve hovedkomponentene slik at du blir mer kjent med produktet.

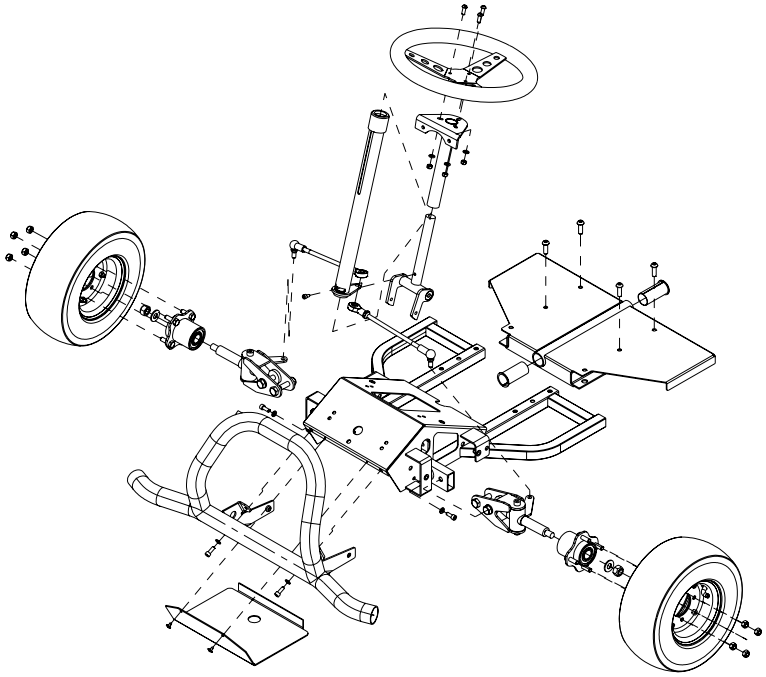
Bakramme

Bakrammen inneholder sveist bakramme, drivlinje (motor/differensial/nav/felger/dekk), batterikasser, fjæring, nødbrems og seteinnfestning. Se figur.



Frontramme

Frontrammen inneholder sveist frontramme, forlengerramme, hjulspindel m/fjæring, hjulnav, felger, dekk, støtfanger, rattstamme, ratt etc. Se figur.

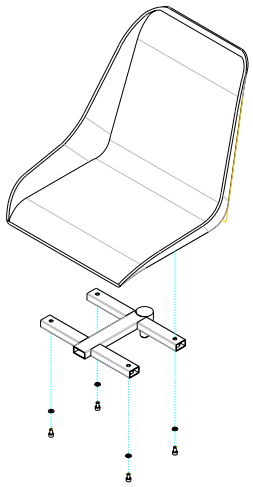


Sete

Dette settes rett ned i seteinnfestningen på bakrammen. Seteinnfestningen kan flyttes frem/tilbake i 4 posisjoner.

Kan fås med følgende tilbehør:

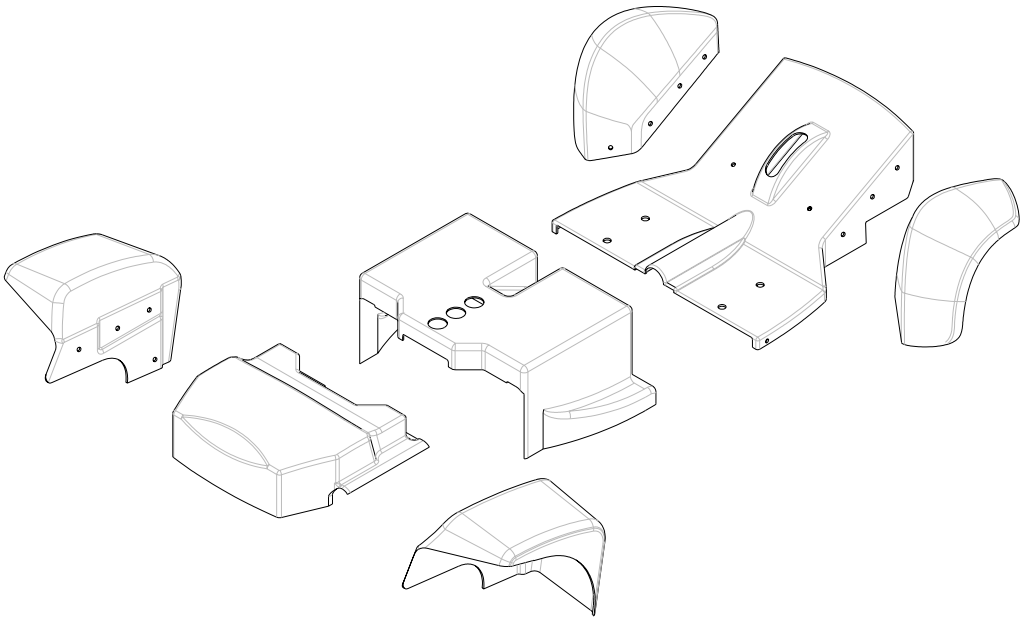
- Seteforskyvning
- Svingsete



Karosseri

Karosseriet består av følgende komponenter:

- Motordeksel
- Batterideksel
- Deksel, frontramme
- Høyre bakskjerm
- Venstre bakskjerm
- Høyre forskjerm
- Venstre forskjerm

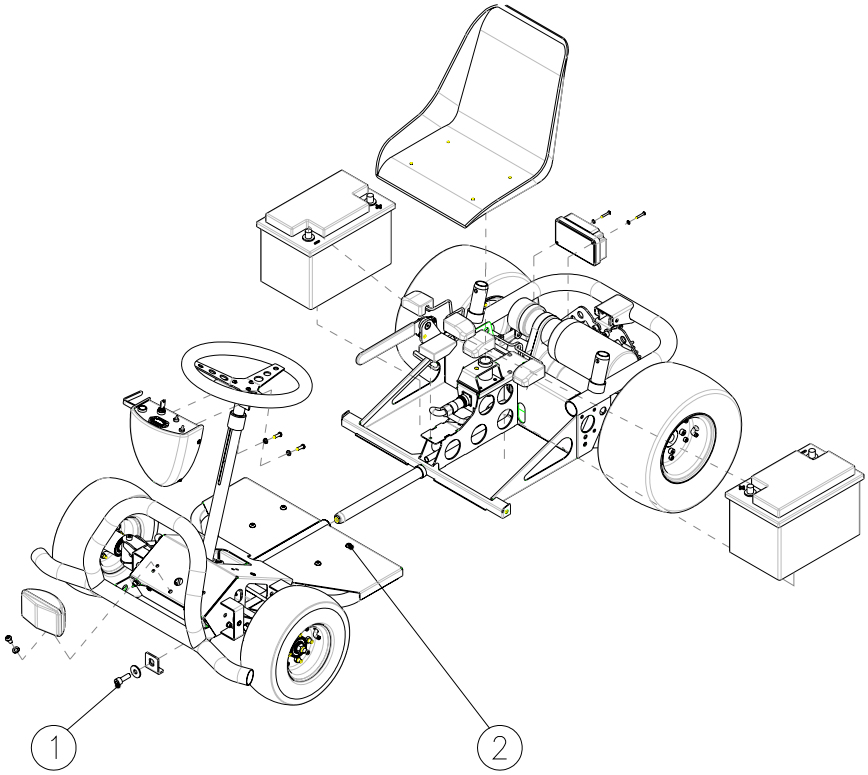


Viktige fremgangsmåter

Dele Raptor

Raptor kan ”deles” på to måter:

1. Ved å skru ut bolten foran (pos 1) på akselen under frontrammen vil Raptor deles i to slik at kun akseltappen på bakrammen stikker ut foran batterikasser.
2. Ved å skru ut de 4 skruene for lengdejustering på frontrammen (pos2) vil Raptor kunne trekkes fra hverandre, forlengerramme på frontrammen vil da stå igjen på bakrammedelen.



Skifte motor/differensial

Det er flere måter å gjøre dette på. Det som står nedenfor er slik vi anbefaler at det gjøres.

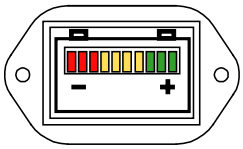
1. Bygg opp under bakrammen i bakkant av batterikassen slik at hjulene går klar av underlaget
2. Koble motorledningene fra kontrolleren
3. Ta ut hovedsikringen
4. Skru av hjul og evt. hjulflens på aksel
5. Demonter fjæringsmodulen
6. Skru ut boltene i festebrakettene til motor/differensial, det er to bolter på hver side
7. Løft ut motor/differensial

Sette inn motor/differensial utføres i motsatt rekkefølge. Se figur ”Bakramme” på side 4.

Elektronikk

Det som står i denne manualen angående elektronikk vil til en hver tid være underordnet den tekniske dokumentasjonen fra PG Drives Technology Ltd for kontrolleren Egis 110A og andre 3. parts leverandører slik som for potmeter etc.

Status indikasjon (informasjonsmeldinger)



Batteri indikatoren (søylen) indikerer statusen til kontrollsystemet. Se figuren til venstre. På engelsk heter den ”*TruCharge Indicator*”. Den er lokalisert på toppen av styreboksen og ses mellom ratt eikene.

Mange innrapporterte feil har vist seg å ikke være relatert til kontrollsystemet, det har vist seg å fungere som det skal. Dette betyr at noen feilmeldinger kan skyldes feil med andre ting på Raptor og ikke med kontrollsystemet.

Batteri indikator konstant / jevn

Dette indikerer at alt er OK.

Batteri indikator blinker sakte

Kontrollsystemet fungerer som det skal, men batteriene bør lades så snart som mulig.

Batteri indikator ruller

Batteriene på Raptor lades. Lader er tilkoblet.

Batteri indikator blinker hvert 5. sekund

Kontrollsystemet er i hvilemodus.

Batteri indikator blinker raskt (selv om styrespaken er ubetjent)

Kontrollsystemets sikkerhetskretser er aktivert og kontrollsystemet får ikke lov til å kjøre Raptor.

Dette indikerer at det er en feil. Vennligst følg denne prosedyren:

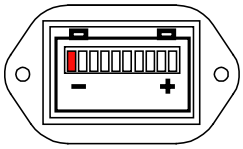
1. Slå av kontrollsystemet.
2. Se til at alle koblinger på Raptor og kontrollsystemet er korrekt koblet sammen.
3. Sjekk tilstanden på batteriene.
4. Hvis du ikke finner feilen, prøv punktene i ”Selvhjelp guiden” på neste side.
5. Slå på kontrollsystemet igjen og prøv å kjøre Raptor. Hvis kontrollsystemets sikkerhetskretser blir aktivert igjen, slå av Raptor og prøv deretter ikke å bruke Raptor igjen. Kontakt din service avdeling.

Sakte eller treg bevegelse

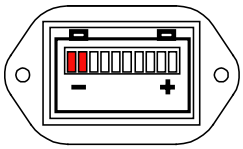
Hvis Raptor ikke går med full fart eller ikke reagerer raskt nok og tilstanden på batteriene er bra, sjekk innstilling for hastighetsbegrensning på styreboksen (potmeter). Hvis ikke det hjelper å justere denne verdien kan det være en ufarlig feil. Kontakt din service avdeling.

Feilmeldinger / Selvhjelp guide

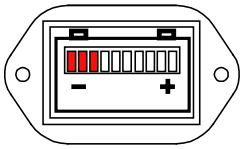
Hvis det oppstår en feil kan du finne ut hva som har skjedd ved å telle antallet søyler på batterimåleren som blinker. Her er en liste over selvhjelp punkter. Prøv å bruke denne listen før du kontakter din serviceavdeling. Gå til det punktet som korresponderer med det antall blinkende søyler og følg instruksjonene.



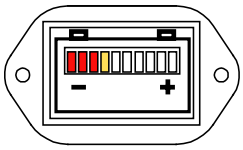
1 søyle: Batteriene trenger å lades, eller det er dårlig kontakt til batteriene. Sjekk forbindelsene til batteriene. Sjekk pluggene til regulatoren. Hvis koblingene er OK, prøv å lade batteriet.



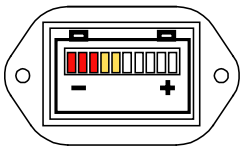
2 søyler: Motoren har dårlig forbindelse. Påse at motorledningen er koblet riktig/godt sammen og at kablene er hele og uskadet. Sjekk også forbindelsen i pluggene.



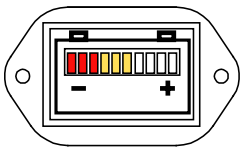
3 søyler: Motoren har en kortslutning til en batterikobling. Kontakt din service avdeling.



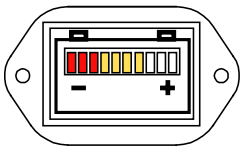
4 søyler: Frihjulsbryteren er aktivert eller bremsen er slått av. Sjekk frihjulsbryteren eller bremsespaken.



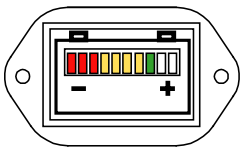
5 søyler: Ikke i bruk.



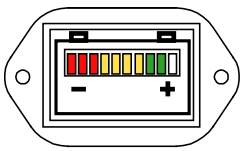
6 søyler: Batteriladeren forhindrer kontrollsystemet i å kjøre Raptor. Koble fra batteriladeren.



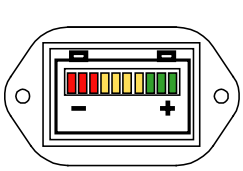
7 søyler: En gasshåndtakfeil er påvist. Påse at gasshåndtaket er i nøytral posisjon før du skrur på kontrollsystemet.



8 søyler: En regulator feil er påvist. Påse at alle koblinger til regulatoren er satt riktig i og at de er helt inne (har god kontakt). Kontakt din service avdeling hvis problemene vedvarer.



9 søyler: Parkeringsbremsen har en dårlig forbindelse/kobling. Sjekk koblingen til parkeringsbrems og motor. Påse at kontrollsystem koblingene er helt inne (har god kontakt).



10 søyler: En feilspenning er anvist på kontrollsystemet. Dette skyldes som oftest dårlig batteriforbindelse. Sjekk batteri og regulator koblingene.

Hvis problemet vedvarer etter at du har sjekket ut det som står ovenfor, kontakt din serviceavdeling.

SP1 Håndholdt programmerer

Kap. 1 -Programmering

1. Innledning

Hovedfordelen ved å bruke den programmerbare kontrollere, er at de lett kan tilpasses de spesielle behov og muligheter for et elektrisk kjøretøy samtidig som sikker drift opprettholdes.

Programmerbare kontrollere oppnår denne gode fleksibiliteten ved å bruke et sett av interne parametere som styrer kjøretøyets hastighet, akselerasjon og bremsing etc. Disse parametrene kan endres og gir store variasjonsmuligheter for å tilpasse oppsettet til forskjellige kjøretøy og brukere, ved hjelp av en enkel håndholdt programmerer.

Det er mulig å sette opp en kontroller slik at den blir ubrukbar i enkelte bruksområder og muligens også for kjøretøyet generelt. Vær varsom når du programmerer en kontroller og hvis du trenger råd angående programmering eller valg av parameterverdier, vennligst kontakt PGDT.

Programmering skal kun utføres av kvalifisert personell med inngående kjennskap til elektronikken og PGDT kontrollere generelt. Feil programmering kan føre til et usikkert oppsett av kjøretøyet for føreren. PGDT og Handicare fraskriver seg et hvert ansvar for tap eller skader hvis programmeringen av kontrolleren avviker fra fabrikkoppsettet.

1.1 Bruk av SP1a med Solo, Egis og S-Drive

Generelt kan alle SP1a håndholdte programmerere brukes sammen med DT125, Solo, Egis og S-Drive kontrollere. Det kan være at noen funksjoner ikke er tilgjengelig, avhengig av den eksakte versjonen av SP1a du har.

Du kan identifisere din SP1a ved å sjekke typenummer. Dette er enten D49371/x eller D50040/x, hvor x er utgaven av programmet i SP1a (release version of the firmware).

Forskjellige versjoner av SP1a er utstyrt med forskjellige koblingsplugger. Disse er:

SP1a (Solo)	D49371/x
SP1a (Egis/S-Drive)	D50040/x

Adapter kan skaffes. For alle detaljer rundt koblingsplugg se avsnitt 3.1.

Tidligere versjoner av SP1a er ikke konfigurert til å kunne programmere de ekstra parametrene i S-Drive eller Egis kontrolleren.

Tabellen nedenfor sammenfatter kompatibiliteten mellom de forskjellige SP1a versjonene og Solo, Egis og S-Drive kontrollerene.

Funksjon/parameter	Kontroller kompabilitet			SP1a versjon (x)	
	Solo	Egis	S-Drive	D50040/x	D49371/x
Forward Acceleration	❍	❍	❍	Alle	Alle
Forward Deceleration	❍	❍	❍	Alle	Alle
Reverse Acceleration	❍	❍	❍	Alle	Alle
Reverse Deceleration	❍	❍	❍	Alle	Alle
Max Fwd Speed	❍	❍	❍	Alle	Alle
Min Fwd Speed			❍	3 og senere	7 og senere
Max Rev Speed	❍	❍	❍	Alle	Alle
Min Rev Speed			❍	3 og senere	7 og senere
Invert Throttle	❍	❍	❍	Alle	Alle
Sleep Timer	❍	❍	❍	Alle	Alle
Read System Log		❍[1]	❍	3 og senere	7 og senere
Read Timer		❍	❍	3 og senere	7 og senere

1) Ikke på kontrollere produsert før september 2002.

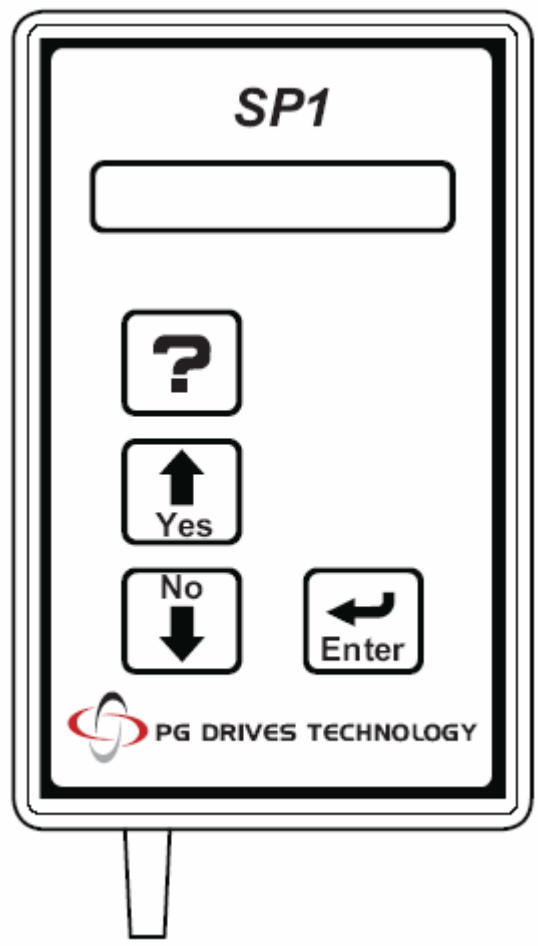
2 SP1a Håndholdt programmerer

SP1a er en håndholdt programmer som er beregnet på Solo, Egis og S-Drive kontrollere fra PG Drives Technology Ltd. Primært er den ment til generell bruk, du kan bruke den til å endre kontrollerens hovedkarakteristikk slik som hastighet, akselerasjon og oppbremsings karakteristikk. SP1a Håndholdt programmerer tillater deg å prøve ut forskjellige oppsett mens den er koblet til kontrolleren.

Den håndholdte programmereren er menystyrt og skal plugges rett inn i kontrolleren, den har en kontekstavhengig hjelpefunksjon tilgjengelig for å veilede brukerne gjennom menyene. SP1a kan også vise feilmeldinger fra kontrolleren noe som tillater hurtig diagnostikk og identifisering av feil på det elektriske systemet slik at disse kan korrigeres raskt.

SP1a utnytter programmerbarheten av kontrolleren og tilbyr funksjoner som ikke er tilgjengelig på mindre avanserte kontroller system.

SP1a tastatur layout



	**Hjelp knapp:**	Ved å trykke på denne knappen vises informasjon om den funksjonen du har valgt. I menyer vil du få vite hva hvert valg gjør, i valgmodus forteller den deg hva du skal gjøre videre.
	**Up / Yes knapp:**	Denne knappen brukes for å bla oppover i menylisten, for å øke parameterverdier og for å velge funksjoner.
	**Down / No knapp:**	Denne knappen brukes for å bla nedover i menylisten, for å senke parameterverdier og for å deaktivere funksjoner.
	**Enter knapp:**	Denne knappen brukes for å lagre valg, verdier og funksjon status. Brukes også for å gå inn og ut av undermenyer.

2.1 Viktig merknad

Å endre parametrene til ikke-kompatible verdier kan ødelegge både kontroller og motor og ugyldiggjøre enhver garanti. Kontakt PGDT hvis du er i den minste tvil. Generelt kan man si at det er mulig å sette opp en kontroller slik at den blir upassende for enkelte brukere og til og med enkelte kjøretøy. Oppsettet kan selvsagt også være og direkte farlig for brukeren og de nære omgivelser.

I tillegg, programmereren (SP1a) skal ikke kobles til kontrolleren når kjøretøyets batterier lades. De høye spenningene som oppstår under ladning kan ødelegge programmereren.

Hvis du trenger noen råd angående programmering, vennligst kontakt PGDT.

3 Bruk av SP1a

Vennligst les denne veiledningen nøye før du begynner å bruke SP1a programmerer.

Programmering skal kun utføres av kvalifisert personell med inngående kjennskap til elektronikken og PGDT kontrollere generelt. Feil programmering kan føre til et upassende oppsett av kjøretøyet for føreren. PGDT og Handicare fraskriver seg et hvert ansvar for tap eller skader hvis programmeringen av kontrolleren avviker fra fabrikkoppsettet.

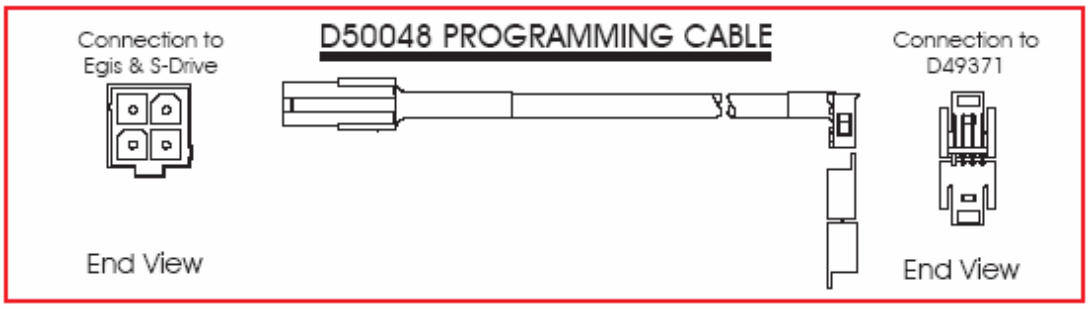
3.1 Tilkobling

SP1a kan tilkobles når kontrolleren er av eller på, det men altså ikke under ladning av kjøretøyets batterier. Du kan også kjøre når SP1a er tilkoblet, men pass på at ledningen ligger slik at det ikke oppstår skader på ledning eller programmerer.

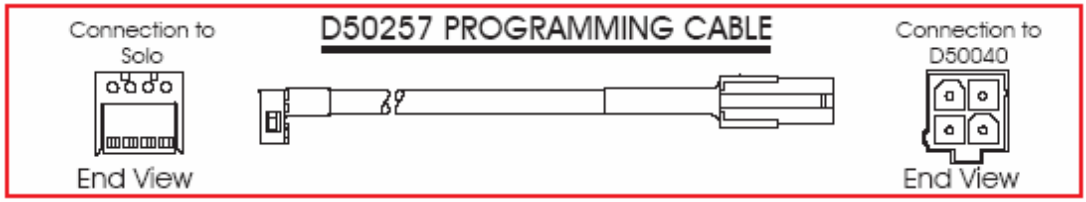
Av sikkerhetshensyn vil endring av enkelte kritiske parametere føre til at kontrolleren kobles ut. Dette er gjort med vilje, kontrolleren kobles lett inn igjen ved at den skrus av og deretter på igjen.

SP1a finnes i flere utgaver med forskjellige koblingsplugger.

D49371 programmereren er laget for Solo kontrolleren, men kan brukes for å programmere Egis og S-Drive kontrollere ved å bruke adapteren D50048.



D50040 programmerere er laget for Egis og S-Drive kontrollere, men kan brukes for å programmere Solo kontrollere ved å bruke adapteren D50257.



Tidligere versjoner av SP1a er ikke konfigurert til å kunne programmere de ekstra parametrene i S-Drive eller Egis kontrollerene.

3.1.1 Programmering

For å programmere kobler du rett og slett SP1a til kontrolleren mens denne er på. Hvis SP1a viser diagnostikk informasjon trykker du på Enter knappen og SP1a vil gå inn i programmeringsmodus.

3.1.2 Diagnostikk

For å bruke SP1a til å vise feilkoder (Trip Codes) og feilmeldinger kobler du den til kontrolleren når den har koblet ut pga. feil (lysene på batterisøylen ruller opp/ned).

Hvis en feil oppstår når SP1a allerede er koblet til, vil ingen diagnose informasjon komme opp på displayet på SP1a.

Når SP1a er koblet til en PGDT programmerbar kontroller kan E.M.C. karakteristikken til kjøretøyet påvirkes. Koble fra SP1a så snart du er ferdig med programmeringen og bruk ikke SP1a i omgivelser som er E.M.C. følsomme.

4 Programmeringsmeny

Menyen inneholder alle de parametrene som bestemmer normal kjørekarakteristikk for kjøretøyet. Hver enkelt parameter er beskrevet i de følgende avsnitt.

4.1 Forward Accel'n?

Justerer verdien for akselerasjon forover for kjøretøyet, med intervall på 1. Det er to innstillinger:

Fast: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Fast".

Slow: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Slow".

Verdiene er omtrentlig vist i "enheter" på 100ms og samsvarer med den tiden det tar fra stillstand til full fart forover er oppnådd. Jo høyere verdien settes jo tregere blir akselerasjonen.

Hvis det ikke er en "Slow/Fast" bryter installert er det kun "Fast" verdien som er relevant.

Settes denne verdien for lavt kan det føre til at kjøretøyet tipper over når du akselererer opp en bratt bakke.

4.2 Forward Decel'n?

Justerer verdien for deselerasjon/oppbremsing forover for kjøretøyet, med intervall på 1. Det er to innstillinger:

Fast: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Fast".

Slow: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Slow".

Verdiene er omtrentlig vist i "enheter" på 100ms og samsvarer med den tiden det tar fra til full fart forover til full stopp er oppnådd. Jo høyere verdien settes jo lengre tid tar det å få stoppet.

Det er produsenten av kjøretøyet som er ansvarlig for å forsikre seg om at kjøretøyets stopplengde fra full fart er i samsvar med de verdier som gjelder i det landet som kjøretøyet skal brukes. For land som krever CE merking er dette spesifisert i EN12184.

4.3 Reverse Accel'n?

Justerer verdien for akselerasjon bakover for kjøretøyet, med intervall på 1. Det er to innstillinger:

Fast: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Fast".

Slow: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Slow".

Verdiene er omtrentlig vist i "enheter" på 100ms og samsvarer med den tiden det tar fra stillstand til full fart bakover er oppnådd. Jo høyere verdien settes jo tregere blir akselerasjonen.

Hvis det ikke er en "Slow/Fast" bryter installert er det kun "Fast" verdien som er relevant.

4.4 Reverse Decel'n?

Justerer verdien for deselerasjon/oppbremsing bakover for kjøretøyet, med intervall på 1. Det er to innstillinger:

Fast: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Fast".

Slow: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Slow".

Verdiene er omtrentlig vist i "enheter" på 100ms og samsvarer med den tiden det tar fra til full fart bakover til full stopp er oppnådd. Jo høyere verdien settes jo lengre tid tar det å få stoppet.

Det er produsenten av kjøretøyet som er ansvarlig for å forsikre seg om at kjøretøyets stopplengde fra full fart er i samsvar med de verdier som gjelder i det landet som kjøretøyet skal brukes. For land som krever CE merking er dette spesifisert i EN12184.

Settes denne verdien for lavt kan kjøretøyet tippe rundt når du rygger ned en bratt bakke og skal stoppe.

4.5 Max forward Speed?

Denne verdien setter MAX fart forover for kjøretøyet. Det er to innstillinger:

Fast: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Fast".

Slow: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Slow".

Verdiene er vist som en prosentandel av kjøretøyets totale tilgjengelige effekt. Hvis "Fast" verdien er satt til 80 % så vil kjøretøyet være i stand til å kjøre med opptil 80 % av totalt tilgjengelig hastighet når "Slow/Fast" bryteren er satt til "Fast".

Hvis det ikke er en "Slow/Fast" bryter installert er det kun "Fast" verdien som er relevant.

Forsikre deg om at kjøretøyets stabilitet er opprettholdt, spesielt ved svinging i maksimal hastighet satt i parameteren "Max Forward Speed".

4.6 Min Forward Speed?

Denne verdien setter MINIMUM fart forover for kjøretøyet.

For at denne parameteren skal ha noen betydning må potensiometer for fartsbegrensning være installert og korrekt programmert. Potensiometer for fartsbegrensning må være satt inn i parallell konfigurasjon. Under disse forutsetningene er det to innstillinger:

Fast: Denne verdien er brukt når kjøretøyets potensiometer for fartsbegrensning er satt til "Slow" og "Slow/Fast" bryteren er satt til "Fast".

Slow: Denne verdien er brukt når kjøretøyets potensiometer for fartsbegrensning er satt til "Slow" og "Slow/Fast" bryteren er satt til "Slow".

Verdiene er vist som en prosentandel av kjøretøyets totale tilgjengelige effekt. Hvis "Fast" verdien er satt til 40 % så vil kjøretøyet være i stand til å kjøre med opptil 40 % av totalt tilgjengelig hastighet når "Slow/Fast" bryteren er satt til "Fast" og potensiometer for fartsbegrensning er satt til "Slow".

Hvis det ikke er en "Slow/Fast" bryter installert er det kun "Fast" verdien som er relevant.

4.7 Max Reverse Speed?

Denne verdien setter MAXIMUM fart bakover for kjøretøyet.

Så lenge en "Slow/Fast" bryter er installert er det to tilgjengelige innstillinger:

Fast: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Fast".

Slow: Denne verdien er brukt når kjøretøyets "Slow/Fast" bryter er satt til "Slow".

Verdiene er vist som en prosentandel av kjøretøyets totale tilgjengelige effekt. Hvis "Fast" verdien er satt til 60 % så vil kjøretøyet være i stand til å kjøre med opptil 60 % av totalt tilgjengelig hastighet når "Slow/Fast" bryteren er satt til "Fast".

Hvis det ikke er en "Slow/Fast" bryter installert er det kun "Fast" verdien som er relevant.

4.8 Min Reverse Speed?

Denne verdien setter MINIMUM fart bakover for kjøretøyet.

For at denne parameteren skal ha noen betydning må potensiometer for fartsbegrensning være installert og korrekt programmert. Potensiometer for fartsbegrensning må være satt inn i parallell konfigurasjon. Under disse forutsetningene er det to innstillinger:

Fast: Denne verdien er brukt når kjøretøyets potensiometer for fartsbegrensning er satt til "Slow" og "Slow/Fast" bryteren er satt til "Fast".

Slow: Denne verdien er brukt når kjøretøyets potensiometer for fartsbegrensning er satt til "Slow" og "Slow/Fast" bryteren er satt til "Slow".

Verdiene er vist som en prosentandel av kjøretøyets totale tilgjengelige effekt. Hvis "Fast" verdien er satt til 20 % så vil kjøretøyet være i stand til å kjøre med opptil 20 % av totalt tilgjengelig hastighet når "Slow/Fast" bryteren er satt til "Fast" og potensiometer for fartsbegrensning er satt til "Slow".

Hvis det ikke er en "Slow/Fast" bryter installert er det kun "Fast" verdien som er relevant.

4.9 Invert Throttle?

Denne parameteren kan settes til ”Yes” eller ”No”. Brukes for å snu kjøreretning for gasspådrag. Nyttig hvis noen vil ha gasspaken på andre siden (venstrehente), da kan man bare endre denne parameteren og snu gasspaken.

Parameteren setter kjøreretning/polariteten for betjeningen på en dobbeltvirkende gasspak eller for en enkeltvirkende gasspak kjøreretning/polaritet for betjening av revers bryter.

Hvis verdien settes til ”No” på et system med dobbeltvirkende gasspak betyr det at når potensiometeret går mot den høye referansen vil kjøreretningen være forover. ”Yes” gir det motsatte.

Hvis verdien settes til ”No” på et system med enkeltvirkende gasspak og revers bryterens inngang er koblet til 0V da vil kjøreretningen være revers. ”Yes” gir det motsatte.

4.10 Sleep Timer?

Her kan man sette verdien for hvor lenge kjøretøyet skal vente (uten input) før det går i dvale (hvilemodus). Hvis kjøretøyets elektronikk ikke betjenes på noen måte i det tidsrommet som er satt vil systemet gå i dvale på en kontrollert måte.

Tidsverdien kan settes fra 0 til 20 minutter. Hvis verdien settes til 0 vil kjøretøyet ikke gå i dvale. Funksjonen er da deaktivert (avslått).

Med dvale mener vi at elektronikken nedsetter kraftforbruket til et minimum.

Batteriindikatoren på styreboksen vil blinke hvert 5 sekund når kjøretøyet er i dvale. For å aktivere elektronikken etter at det er gått i dvale må kontrolleren slås av og på igjen.

4.11 Read System Log?

Viser en diagnostisk log som lagrer antall forekomster/hendelser av de siste 8 påviste system problemer. Se eget kapittel for feilmeldinger.

4.12 Read Timer?

Viser tiden kontrolleren er kjørt. Verdien er vist i hele timer.

Kap. 2: Diagnostikk

1 Innledning

Hovedmålsettingen med dette kapitlet er å hjelpe service personell med feilsøking på kjøretøyets elektronikk. Målet er å finne den sannsynlige årsaken til en detektert feil i det elektriske systemet på kjøretøyets elektronikk.

Det er viktig å være klar over at selv om kontrolleren rapporterer om en feil i det elektriske systemet så kan det være kontrolleren selv som er defekt. Grunnen til dette er at kontrolleren er i stand til å detektere feil i andre elektriske komponenter (motor, batterier, magnetbrems etc.) eller kablingen til disse. Når kontrolleren har detektert en feil vil det vises som systemfeilmelding på batterisøylen.

Dette kapitlet dekker diagnostikk for kjøretøy utstyrt med Solo, Egis og S-Drive kontrollere fra PG Drives Technology Ltd. For grunnleggende diagnostikk er det nødvendig med en programmeringsenhet når man bruker denne manualen, da kontrolleren har et avansert innebygd system for diagnostikk.

Ved å bruke denne manualen, er det mulig å plassere feilmeldingen i en av 10 typer feil. Når type feil er fastslått gis det forslag til hva årsaken kan være og hvordan man kan rette opp feilen.

Dette kapitlet skal kun brukes for å fastslå hvor du skal starte med din egen diagnostikk, siden kontrolleren kan indikere feil i en annen tilknyttet komponent selv om det er kontrolleren selv som er defekt. Erfaringsmessig er det i hovedsak kontakter og kabling som er grunnen til problemer med kjøretøyets elektriske system, så det er hensiktsmessig å begynne med disse sårbare områdene først.

Diagnostikk skal kun utføres av kvalifisert personell med inngående kjennskap til tekniske hjelpemidler, elektronikken og PGDT kontrollere generelt. En reparasjon som er utført feil eller en reparasjon som påvirker systemet i negativ retning (forringer systemet) kan resultere i et farlig oppsett av kjøretøyet. PGDT og Handicare fraskriver seg et hvert ansvar for tap eller skader som oppstår på grunn av en slik reparasjon.

1.1 Diagnostikk prosessen

For en effektiv og virkningsfull diagnostikk bør følgende grunnleggende punkter følges:

- Fastslå hvilen type kontroller kjøretøyet er utstyrt med.
- Sjekk at det er en systemfeil, eller har vært en periodevis tilbakevendende systemfeil. Se avsnitt 2.
- Fastslå type feil. Se avsnitt 3.
- Sjekk tabellen for feilmeldinger for den kontrolleren det gjelder. Se kap. 3, 4 og 5 avhengig av type kontroller.
- Referer til mulig årsak i tabellen for feilmeldinger som korresponderer til feilmeldingen. Utfør anbefalte kontroller og korrigerende tiltak. Se kap. 3, 4 og 5 avhengig av type kontroller.

2 Påvise at systemfeil har forekommet

Avhengig av hvordan kontrolleren er programmert og oppsettet av kjøretøyet vil en systemfeil vises på en av to måter.

- På batterisøyle indikatoren (TrueCharge Indicator).
- På en LED eller en enkel lyspære indikator.

Batterisøyle indikatoren virker på følgende måte.

2.1 Blinker raskt

Kontrolleren er utkoblet på grunn av feil. For å fastslå type feil, se avsnitt 3 ???. Hvis du kobler til en håndholdt programmerer når dette skjer vil den gi deg en feilkode.

2.2 Blinker sakte

Ingen feil er påvist i systemet. Den sakte blinkingen indikerer at batteriene trenger lading.

En feil kan ha forekommet tidligere, se kapittel 1 avsnitt 4.11 for å finne ut hvordan du leser kontrollerens system logg, deretter avsnitt 3.1 for å fastslå type feil.

2.3 Lyser jevnt

Kontrolleren er ikke utkoblet.

En feil kan ha forekommet tidligere, se kapittel 1 avsnitt 4.11 for å finne ut hvordan du leser kontrollerens system logg, deretter avsnitt 3.1 for å fastslå type feil.

2.4 Lyser ikke i det hele tatt

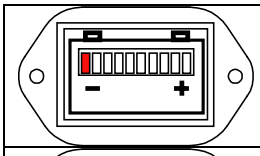
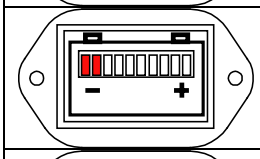
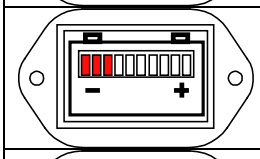
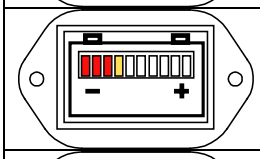
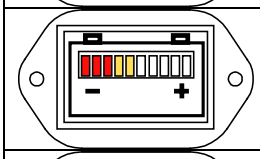
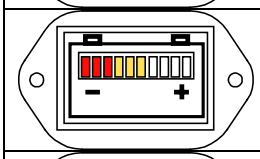
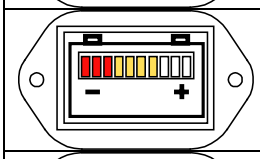
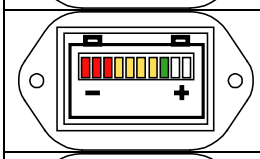
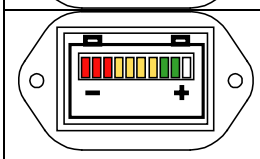
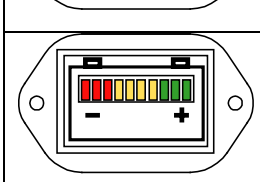
Det er ikke strøm til kontrolleren. Forsikre deg om at batteriene er fulladet og at alle koblinger mellom batteriene og kontrolleren er i orden. Hvis de er det kan det være kontrolleren som er defekt. Se avsnitt 7 ???.

3 Feil diagnostikk

Handicare Raptor er utstyrt med batterisøyle indikator (TrueCharge) og diagnose indikator, det to metoder for feil diagnostikk.

3.1 Feil diagnostikk med batterisøyle indikator

Hvis det oppstår en feil kan du finne ut hva som har skjedd ved å telle antallet søyler på batterimåleren som blinker. Her er en liste over selvhjelp punkter. Prøv å bruke denne listen før du kontakter din serviceavdeling. Gå til det punktet som korresponderer med det antall blinkende søyler og følg instruksjonene.

	**1 søyle**: Batteriene trenger å lades, eller det er dårlig kontakt til batteriene. Sjekk forbindelsene til batteriene. Sjekk pluggene til regulatoren. Hvis koblingene er OK, prøv å lade batteriet.
	**2 søyler**: Motoren har dårlig forbindelse. Påse at motorledningen er koblet riktig/godt sammen og at kablene er hele og uskadet. Sjekk også forbindelsen i pluggene.
	**3 søyler**: Motoren har en kortslutning til en batterikobling/pol. Kontakt din service avdeling.
	**4 søyler**: Bremsen er slått av. Sjekk bremsespaken. *Ikke gjeldende for Handicare Raptor:* *Frihjulsbryteren er aktivert. Sjekk frihjulsbryteren*
	**5 søyler**: Ikke i bruk.
	**6 søyler**: Batteriladeren forhindrer kontrollsystemet i å kjøre Raptor. Koble fra batteriladeren.
	**7 søyler**: En gasshåndtakfeil er påvist. Påse at gasshåndtaket er i nøytral posisjon før du skrur på kontrollsystemet.
	**8 søyler**: En regulator feil er påvist. Påse at alle koblinger til regulatoren er satt riktig i og at de er helt inne (har god kontakt).
	**9 søyler**: Parkeringsbremsen har en dårlig forbindelse/kobling. Sjekk koblingen til parkeringsbrems og motor. Påse at kontrollsystem koblingene er helt inne (har god kontakt).
	**10 søyler**: En feilspenning er anvist på kontrollsystemet. Dette skyldes som oftest dårlig batteriforbindelse. Sjekk batteri og regulator koblingene.
Hvis problemet vedvarer etter at du har sjekket ut det som står ovenfor, kontakt din serviceavdeling.	

3.3 Feil diagnostikk med SP1a håndholdt programmerer

Du kan også bruke SP1a håndholdt programmerer fra PG Drives Technology Ltd. for å fastslå eksakt feil type.

For å gjøre dette må du koble til SP1a til kontrolleren når batterisøyle indikatoren blinker raskt, en feilmelding vil da vises på skjermen til SP1a. La oss for eksempel anta at magnetbremsen er koblet fra, feilmeldingen på skjermen til SP1a skal da være følgende:

> Diagnosis…. Code 1500: solenoid brake fault – check brakes and connections. Press enter to continue.

Som du ser ovenfor er det et firesifret tall, dette er kjent som feilkoden, i dette tilfellet 1500.

Når denne koden er brukt i samsvar med tilhørende feilkode i tabellen for kontrolleren, se kapittel 3, 4 og 5, kan du bestemme type feil (1 til 10).

Kap. 4: Egis diagnostikk

1 Introduksjon

Dette kapitlet er spesifikt for Egis kontrolleren fra PG Drives Technology Ltd. Det beskriver feilmeldingstyper, hva de betyr og gir forslag til videre problemløsning.

Diagnostikk skal kun utføres av kvalifisert personell med inngående kjennskap til tekniske hjelpemidler, elektronikken og PGDT kontrollere generelt. En reparasjon som er utført feil eller en reparasjon som påvirker systemet i negativ retning (forringer systemet) kan resultere i et farlig oppsett av kjøretøyet. PGDT og Handicare fraskriver seg et hvert ansvar for tap eller skader som oppstår på grunn av en slik reparasjon.

2 Egis Feilkode tabell

Feilkode (Trip Code)	Feiltype (Trip Type)	Beskrivelse
0810	7	Gasspak feil. Se avsnitt 3.7
0814	7	Gasspak feil. Se avsnitt 3.7
0815	7	Gasspak feil. Se avsnitt 3.7
0816	7	Gasspak feil. Se avsnitt 3.7
0817	7	Gasspak feil. Se avsnitt 3.7
1D02	8	Gasspak feil. Se avsnitt 3.7
0A00	Blink	Dvale modus. Se avsnitt 3.11
1500	9	Brudd i magnetbrems krets. Se avsnitt 3.9
1501	9	Kortslutning i magnetbrems krets. Se avsnitt 3.9
1502	9	Overspenning i magnetbrems krets. Se avsnitt 3.9
1600	10	Høy batterispenning. Se avsnitt 3.10
1D02	7	Gasspak feil. Se avsnitt 3.7
1E03	6	Inhibit Aktiv (sperresignal). Se avsnitt 3.6
2C00	1	Lav batterispenning. Se avsnitt 3.1
2C01	1	Lav batterispenning. Se avsnitt 3.1
2F01	7	Indikerer gasspak ute av stilling. Se avsnitt 3.7
3B01	2	Motor frakoblet. Se avsnitt 3.2
7000	4	Frihjul modus innkoblet. Se avsnitt 3.4
7001	4	Frihjul modus innkoblet. Se avsnitt 3.4
Alle andre	8	Mulig kontroller feil

Ved andre feilkoder kan PG Drives Technology Ltd. kontaktes for nærmere detaljer hvis du føler behov for det.

For feiltype og mulig årsak henviser vi til PG Drives Tecnologys manual:

“SP1A. Programmer for Solo, Egis and S-Drive Controllers. Programming and Diagnostics”.

Denne er på engelsk. Se vedlegg V-2, Chapter 4.3.

Dette gjelder også for andre områder som ikke er dekt av denne servicemanualen, se da i dokumentasjonen fra PG Drives Technology.

Vedlegg

V-1: Egis manual fra PG Drives Technology Ltd.

Manualen “Egis Series Scooter Controller. Operation and Installation” er skrevet på engelsk og er på 74 sider. Den har egen sidenummerering (begynner på nytt).

V-2: SP1A manual fra PG Drives Technology Ltd.

Manualen “SP1A. Programmer for Solo, Egis and S-Drive Controllers. Programming and Diagnostics” er skrevet på engelsk og er på 66 sider. Den har egen sidenummerering (begynner på nytt).

PG DRIVES TECHNOLOGY

EGIS SERIES SCOOTER CONTROLLER

OPERATION & INSTALLATION

SK75326/6

TABLE OF CONTENTS

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About this manual

This manual is split into 6 chapters which are in turn split into separate sections. Each chapter deals with a specific issue.

Chapter 1 - Operation

This chapter deals with the controls and functionality of the Egis Scooter Controller.

Chapter 2 - Installation

This chapter deals with the mounting, connection, wiring and setup procedures for the Egis Scooter Controller.

Chapter 3 - Tiller Module Installation

This chapter deals with the mounting, connection, wiring and setup procedures for the Tiller Module.

Chapter 4 - Warning Summary

Lists all the Warnings used within the manual.

Chapter 5 - Specifications

Lists all the Electrical Specifications of the Egis Scooter Controller.

ICONS

PG Drives Technology Ltd. will be abbreviated to PGDT throughout the manual.

Throughout the manual icons are used to draw the reader's attention.

The icons used are:

Note - A general point for best practice.

Caution - A point of safety which if ignored could result in damage to the control system or the vehicle.

Warning - A point of safety which if ignored could cause injury to the individual.

CHAPTER I
OPERATION

1 Introduction

The relevant contents of this chapter should be included in the scooter operating guide. Further copies are available from PGDT in both written or disk (Adobe PDF) format. Copies should not be made without the express permission of PGDT.

The operation of the Egis series of scooter controllers is simple and easy to understand. The controller incorporates state-of-the-art electronics, the result of many years of research, to provide you with ease of use and a very high level of safety. In common with other electronic equipment, correct handling and operation of the unit will ensure maximum reliability.

Please read this user chapter carefully - it will help you to keep your scooter reliable and safe.

2 General

2.1 Handling

Avoid knocking your controller, especially the connectors. Never drop the controller.

When transporting your scooter, make sure that the controller is well protected. Avoid damage to cables.

2.2 Operating Conditions

Your controller uses industrial-grade components throughout, ensuring reliable operation in a wide range of conditions. However, you will improve the reliability of the controller if you keep exposure to extreme conditions to a minimum.

Do not expose your controller or its components to damp for prolonged periods.

3 Controls

Depending on the specification of scooter to which the Egis is fitted, some or all of the following controls will be used.

3.1 On/Off Switch

The on/off switch applies power to the controller electronics, which in turn supply power to the motor. Do not use the on/off power switch to stop the scooter unless there is an emergency. (If you do, you may shorten the life of the scooter drive components).

Some scooters may have a keyswitch in addition to the normal on/off switch, the function of the keyswitch is the same as the on/off switch.

[Scooter manufacturers to include user controls layout diagram here.]

3.2 Status Indicator

Depending on the scooter model, the status indicator may be a single bulb (or LED) or a PGDT TruCharge battery and diagnostics indicator.

The status indicator shows you that the scooter is switched on. It also indicates the operating status of the scooter. Details are given in section 8.0.

3.3 Throttle

The throttle controls the speed of the scooter. The further you push the throttle, the faster your scooter will move. When you release the throttle the brake is automatically applied.

Depending on the scooter model, the throttle configuration may be one of two types - wig-wag or single-ended.

3.3.1 Wig-wag Throttle

In this configuration, both the speed and the direction of the scooter are controlled by the throttle. To drive forwards, push the throttle in one direction: to drive in reverse, push the throttle in the other direction.

3.3.2 Single-ended Throttle

In this configuration, just the speed of the scooter is controlled by the throttle. When the throttle is pushed - depending on the position of the reverse switch (see section 3.4) - the scooter will drive in either the forward or reverse direction.

3.4 Reverse Switch

This switch will only be fitted to the scooter if the throttle configuration is single-ended (see section 3.3.2). The switch is used to change between forward and reverse drive.

3.5 Speed Limiting Control

This control sets the maximum speed of the scooter. Turn the knob clockwise to increase the maximum speed setting or anti-clockwise to decrease the maximum speed setting.

3.6 Slow/Fast Switch

This switch selects the driving mode - either slow or fast - of the scooter. You can use this switch to limit the scooter's driving behavior in environments where that may be desirable or necessary, e.g. if you are driving indoors or on the sidewalk.

3.7 Freewheel Switch

This switch allows you to push the scooter without having to mechanically disengage the parking brake. Whilst this switch is operated, the controller will not allow drive and the speed at which the scooter can be pushed will be limited to 75% of the maximum driving speed.

If you operate this switch whilst you are driving, the controller will stop the scooter and signal a fault.

3.8 Reverse Alarm

This provides an audible warning when the scooter is being driven in the reverse direction.

4 Getting Ready to Drive

Check that the speed limiting control is turned to a position which suits you.

Operate the on/off switch. A TruCharge type status indicator will blink and turn on after half a second. A single bulb (or LED) type status indicator will turn on immediately.

If the scooter has a single-ended throttle, use the reverse switch to select the direction you want to drive and then push the throttle to control the speed. If the scooter has a wig-wag throttle, push the throttle in the direction you want to drive.

During the first half-second after the scooter is switched on, the controller is performing important safety checks within itself and the rest of the scooter's electrical system. Therefore, if you push the throttle during this time, you will not be able to drive until you have returned the throttle to the rest position. This condition is indicated on a single bulb (or LED) type status indicator by a rapid flashing, or on a TruCharge type status indicator by a "rippling " up and down of the battery gauge.

If you do not push the throttle as you switch the scooter on and the status indicator flashes rapidly, then there may be a fault. Refer to section 8.4 for details.

5 Tips for Using Your Controller

5.1 Driving - General

Make sure that all the controls are within easy reach and are comfortable to operate.

5.2 Driving Technique

The controller interprets the throttle movements and reverse switch setting (if fitted) and drives the scooter in the correct direction at the appropriate speed. You will need very little concentration to control the scooter, which is especially useful if you are inexperienced.

The further you push the throttle away from the rest position, the faster the scooter will go.

The intelligent speed control system minimizes the effects of slopes and different types of terrain.

The scooter user must be capable of driving a scooter safely. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

6 Precautions for Use

In the event of the scooter moving in an unexpected way RELEASE THE THROTTLE. This action will stop the scooter in any circumstances.

6.1 Hazards

Do not drive the scooter:

- Beyond restrictions indicated in your scooter user manual, for example inclines, curb heights etc.
- In places or on surfaces where a loss of wheel grip could be hazardous, for example on wet grassy slopes.
- If you know that the controller or other crucial components require repair.

Although the Egis is designed to be extremely reliable and each unit is rigorously tested during manufacture, the possibility of system malfunction always exists (however small the probability). Under some conditions of system malfunction the controller must (for safety reasons) stop the scooter instantaneously. If there is any possibility of the user falling out of the scooter as a result of a sudden braking action, it is imperative that a restraining device such as a seat belt is supplied with the scooter and that it is in use at all times when the scooter is in motion. PGDT accept no liability for losses of any kind arising from the unexpected stopping of the scooter, or arising from the improper use of the scooter or controller.

Do not operate the scooter if it behaves erratically, or shows abnormal signs of heating, sparks or smoke. Turn the scooter off at once and consult your service agent. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

Electronic equipment can be affected by Electro Magnetic Interference (EMI). Such interference may be generated by radio stations, TV stations, other radio transmitters and cellular phones. If the scooter exhibits erratic behavior due to EMI, turn it off immediately and consult your service agent. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

It is the responsibility of the scooter manufacturer to ensure that the scooter complies with appropriate National and International EMC legislation. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

The scooter user must comply with all scooter safety warnings. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

7 Safety Checks

The electronic circuits in the Egis have been designed to be extremely safe and reliable. The on-board microcomputer carries out safety checks at up to 100 times per second. To supplement this safety monitoring you should carry out the following periodic checks.

If the control system fails any of these checks, do not use the scooter and contact your service agent.

7.1 Daily Checks

Throttle: With the scooter switched off, check that the throttle mechanism is not bent or damaged and that it returns to the rest position when you push and release it. If there is a problem do not continue with the safety checks and contact your service agent.

7.2 Weekly Checks

Throttle: Put the throttle to the full speed forward position and switch the scooter on. The scooter should not move. To show you that you have switched the scooter on with the throttle already pushed, a TruCharge type status indicator will “ripple” up and down, whereas a single bulb (or LED) type status indicator will flash rapidly.

If the scooter does move, contact your service agent.

Parking brake: This test should be carried out on a level surface with at least one meter clear space around the scooter.

Switch the scooter on.

Check that the status indicator remains on, or flashes slowly, after half a second.

Go to drive the scooter slowly in the forwards direction until you hear the parking brake operate. The scooter may start to move.

Immediately release the throttle. You must be able to hear the parking brake operate within a few seconds.

Repeat the test in the reverse direction.

Cables and connectors:

Check that all connectors on the scooter are securely mated, and ensure that all cables are free from damage.

7.3 Servicing

To ensure continued satisfactory service, we suggest you have your scooter and control system inspected by your service agent after a period of one year from commencement of service. Contact your service agent for details when the inspection is due.

8 Status Indication

Depending on the scooter model, the status indicator may be a single lamp (or LED) or a TruCharge battery gauge and diagnostics display. Both types indicate the status of the controller. See section 10 for more details of TruCharge battery gauge.

Please note that a number of supposedly faulty controllers returned to PGDT are subsequently found to operate correctly. This indicates that many faults are due to problems on the scooter rather than within the controller.

8.1 Status Indicator Steady

This indicates that all is well.

8.2 Status Indicator Flashes Slowly

The controller is functioning correctly, but you should charge the batteries as soon as possible.

8.3 Status Indicator Blinks Off Every 5 Seconds

The controller has detected that the batteries are being charged.

8.4 Status Indicator Flashes Rapidly (even with throttle released)

The controller safety circuits have operated and the controller has been prevented from moving the scooter.

This indicates that there is a fault. Please follow this procedure:

- Switch off the scooter.
- Make sure that all connectors on the scooter are mated securely.
- Check the condition of the battery.
- If you can't find the problem, try using the self-help guide in section 8.5.
- Switch the scooter on again and try to drive. If the safety circuits operate again, switch off and do not try to use the scooter. Contact your service agent.

8.5 Self-Help Guide

If a fault occurs and you have a scooter model fitted with a TruCharge display, you can find out what has happened by counting the number of bars that are flashing on the battery gauge.

The following diagrams give an overview of the fault types and a list of self-help actions. Try to use this list before you contact your service agent. Go to the number in the list which matches the number of flashing bars and follow the instructions.

8.6 Diagnostic Flash Code Feature

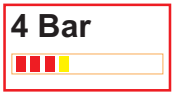
The Diagnostic Flash Code Feature is a factory programmed feature that allows a single status lamp or LED to display the TruCharge fault code. This is done by pulsing the lamp on for a number of times equivalent to the number of TruCharge bars that would be flashing for a given fault.

The information in the following diagrams still applies, so for example, if an Egis with this feature enabled had a throttle fault, the status lamp would flash 7 times, pause briefly, flash 7 times, pause briefly and so on.

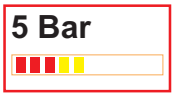
The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, try charging the battery.

There is a bad connection to the motor. Check all connections between the motor and the control system.

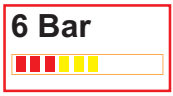
The motor has a short circuit to a battery connection. Contact your service agent.



The freewheel switch or manual brake disengagement mechanism are operated. This is instigated only on systems where there is a switch wired to the Egis' Freewheel input.Check the position of the switch



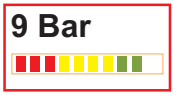
Not used.



The controller is being inhibited from driving, this may be because the battery charger is connected or the seat is not in the driving position.

A throttle fault is indicated. Make sure that the throttle is in the rest position before switching on the scooter.

A controller fault is indicated. Make sure that all connections are secure. Contact your service agent.



There is a bad connection to the parking brake. Some scooters will register this error type when the freewheel lever is disengaged. First of all, check the freewheel lever is in the drive position, then check all connections between the parking brake and the controller.

An excessive voltage has been applied to the controller. This is usually caused by a poor battery connection. Check the battery connections.

8.6 Slow or Sluggish Movement

If the scooter does not travel at full speed and the battery condition is good, check the position of the speed limiting control. If adjusting the speed limiting control does not remedy the problem then there may be a non-hazardous fault. Contact your service agent.

9 Pushing your Scooter

Depending on the scooter model you have and the status of the controller, there are different methods of easily pushing your scooter.

9.1 Using Freewheel Switch

If the scooter is fitted with a freewheel switch then you can easily push the scooter by operating this switch with the scooter switched on. Whilst the switch is operated, the scooter is prevented from driving and the freewheel speed is limited to 75% of the maximum driving speed. See section 3.7 for more details.

9.2 Disengaging the Parking Brake

If the scooter does not have a freewheel switch or the controller has detected a fault, then to push the scooter, you must mechanically disengage the parking brake. Your scooter will be fitted with a special lever to do this.

Depending on the gear ratio between the motor and the drive wheels, it may be difficult to push the scooter. If it is, switch off the scooter and less force will then be required.

If you have disengaged the brake and the controller has detected a fault or the scooter is switched off, then it may be possible for the scooter to freewheel at potentially dangerous speeds. Therefore, do not push the scooter up or down inclines on which you cannot stop or hold the scooter. Never sit on the scooter when the parking brake is disengaged. PGDT accept no liability for losses of any kind arising from the scooter being moved with the parking brake disengaged.

10 Battery Gauge

Depending on the type of scooter you have, the battery gauge may be a single bulb (or LED) or a TruCharge display. How to read each type is described in the following sections.

The battery gauge is included to let you know how much charge is left in your batteries. The best way for you to use the gauge is to learn how it behaves as you drive the scooter. Like the fuel gauge in a car, it is not completely accurate, but it will help you avoid running out of "fuel".

Depending on the type of scooter you have, the battery gauge may also show you the charging status of the batteries.

The battery gauge works in the following way.

When you switch on the controller, after half a second, the battery gauge shows an estimate of the remaining battery charge.

The battery gauge gives you a more accurate reading about a minute after you start driving the scooter.

If you are charging the batteries and the scooter type you have is able to show you charging status, this information is accurate 5 seconds after the charger is connected.

When you replace worn out batteries, fit the type recommended by the scooter manufacturer. If you use another type the battery gauge may be inaccurate.

The amount of charge in your batteries depends on a number of factors, including the way you use your scooter, the temperature of the batteries, their age and the way they are made. These factors will affect the distance you can travel in your scooter. All scooter batteries will gradually lose their capacity as they age.

The most important factor that reduces the life of your batteries is the amount of charge you take from the batteries before you recharge them. Battery life is also reduced by the number of times you charge and discharge the batteries.

To make your batteries last longer, do not allow them to become completely flat. Always recharge your batteries promptly after they are discharged.

If your battery gauge reading seems to fall more quickly than usual, your batteries may be worn out.

10.1 How To Read a Single Bulb (or LED) Battery Gauge

If the battery gauge is steady then you have more than 20% battery charge remaining.

If the battery gauge is flashing slowly then you have less than 20% battery charge remaining and you should charge the batteries as soon as possible.

10.2 How To Read a TruCharge Battery Gauge

The way in which the battery gauge should be read depends on whether you are driving the scooter or charging the batteries. Each case is explained below.

10.2.1 Driving

If the battery gauge shows red, yellow and green, the batteries are charged.

If the battery gauge show just red and yellow, then you should charge the batteries as soon as you can.

If the battery gauge shows just red, either steady or flashing slowly, then you should charge the batteries immediately.

Do not operate the scooter if the battery is nearly discharged. Failure to comply with this condition may leave the user stranded in an unsafe position, such as in the middle of a road. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition

10.2.2 Charging

In this display mode the battery gauge blinks off every 5 seconds.

If the battery gauge shows red, yellow and green, the batteries are nearly or fully charged.

If the battery gauge shows red and yellow or just red, then you should continue charging your batteries.

This facility is only available on certain scooter types.

II Battery Charging

To charge the scooter batteries connect the charger plug into the battery charger socket on the scooter. You will not be able to drive the scooter when the charger is connected.

Do not exceed the maximum charging current for the scooter. PGDT accepts no responsibility for losses of any kind from failure to comply with this condition.

Ensure that the charger plug pins are of the correct polarity to be compatible with the scooter's charging socket. Failure to observe this condition could result in a burn hazard or a fire hazard. PGDT accepts no responsibility for losses of any kind from failure to comply with this condition.

Do not disconnect the batteries or open-circuit the circuit breaker while charging is in progress. Failure to observe this condition could result in a burn hazard or a fire hazard. PGDT accepts no responsibility for losses of any kind from failure to comply with this condition.

Only use the battery charger that has been supplied with your scooter. The use of incorrect chargers could damage the batteries, scooter, controller or charger itself, or may result in parts overheating creating the potential for burns or even fire. PGDT accepts no responsibility for losses of any kind from failure to comply with this condition.

12 Programming

If you cannot find a position of the speed limiting control that suits you, the controller can be programmed to meet your needs. The controller can be programmed in two ways – with an SP1 Programmer or with a Pocket Programmer.

The SP1 is a small hand-held unit which can be plugged into your controller to alter the program.

A Pocket Programmer is an interface module and a piece of software for Palmtop type computers. The module connects into the controller and then communicates with the Palmtop PC so that the controller can be programmed using a Windows type environment

The programming tools may be included with your scooter. If they are not, your scooter distributor or service agent or scooter manufacturer will be able to program your controller for you.

If you have a programmer, read the user guide before you use it.

If you re-program your controller, make sure that you observe any restrictions given in your scooter user manual. Note any changes you make for future reference.

Programming should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a scooter for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values.

13 Controller Servicing

All repairs and servicing must be carried out by authorized service personnel. Opening or making any unauthorized adjustments or modifications to the controller or its components will invalidate any warranty and may result in hazards to yourself or other people, and is strictly forbidden.

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modifications to the Egis controller.

If the Egis controller is damaged in any way, or if internal damage may have occurred through impact or dropping, have the product checked by qualified personnel before operating. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

14 Warranty

The Egis Scooter Controller is covered by a warranty period defined by the scooter manufacturer. For details of the warranty period, please contact your service agent.

The warranty will be void if the Egis Scooter Controller has:

- Not been used in accordance with the Egis Scooter Controller Technical Manual, SK75326.
- Been subject to misuse or abuse.
- Been modified or repaired by non-authorized persons.

The warranty will be void if the Egis has not been used in accordance with Egis Technical Manual SK75326, the Egis has been subject to misuse or abuse, or if the Egis has been modified or repaired by unauthorized persons.

CHAPTER 2
INSTALLATION

1 Documentation

1.1 Egis Operation

Study Chapter 1: Operation. It is important that the information in Chapter 1 is supplied with the scooter, either as part of the scooter user handbook or as a separate document.

This chapter sets out the installation conditions that must be complied with in order to meet the safety requirements of ISO7176-14.

1.2 Program Settings

You must supply the controller programmed with the manufacturer's preset settings. Controllers are always supplied by PGDT with the preset settings shown on the data sheet.

The preset settings are chosen with the scooter manufacturer to ensure safe operation and compliance with relevant legal requirements over the whole of the operating range of the throttle, and speed limiting control.

The scooter must stop within the maximum distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184.

Users with particular disabilities may need very low braking rates. However, if the controller is programmed with a low braking rate, the stopping distance may be more than that specified. If this happens, the maximum speed must be re-programmed so that the stopping distance requirement is satisfied.

State in the scooter user handbook that it is the responsibility of the person programming the controller to make sure that the stopping distance requirement is satisfied. If the braking rate is low, the forward and reverse maximum speed settings may need to be re-programmed.

To assist the person in this task, include a graph in the scooter user handbook showing the relationship between the maximum forward/reverse speed settings and the forward/reverse braking rate which is required to ensure the correct stopping distance.

It may be possible to program settings which compromise the stability of the scooter. Perform suitable tests to establish which programming restrictions are needed to prevent instability. State any programming restrictions in the scooter user handbook.

State in the scooter user handbook that it is the responsibility of the person programming the controller to make sure that the settings are safe and to note any programming changes that they make.

Programming should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a scooter for the user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values. PGDT accept no liability for losses of any kind if the drive or stability characteristics of the scooter are altered without prior notification and discussion with PGDT.

1.3 Soft-Stop

If the version of Egis you have has the Soft-Stop function enabled (see controller data sheet), you must ensure that the emergency stopping distance is within the distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184.

1.4 Other Information

You must provide a diagram in the scooter user handbook showing the user controls.

In addition, you should include a brief specification of operating supply voltage range and operating temperature range.

2 Immobilizing the Scooter

2.1 Prevention of Unauthorized Use

Some markets require the scooter to have a means of preventing unauthorized use. This typically means fitting a keyswitch which can prevent the controller from being switched on.

2.2 Charger Interlock

ISO 7176-14 requires you to provide a means of preventing the use of the scooter while the batteries are being charged. The Egis includes an inhibit input which can be used to provide this function. Refer to section 7.1 for details.

Contact PGDT if you need advice..

The scooter manufacturer is responsible for providing a means of preventing the use of the scooter while the batteries are being charged. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

3 Connections

3.1 General

Study the data sheet for the control system to identify:

- The output current, ratings and restrictions
- The connector pin assignments

Recommendations for the cross-sectional area, ratings and materials for wiring are given in the table in section 3.5. These depend on the application. You are responsible for establishing the suitability of the particular wiring arrangement used on the scooter. PGDT can make general recommendations for wiring to Egis Controller, but PGDT accepts no responsibility for the wiring arrangement used.

Make sure that the connectors you use are reliable under all operating conditions and correctly wired with no short circuits. Do not use unsuitable components - it may result in poor scooter reliability.

The scooter manufacturer is responsible for establishing the suitability of the particular wiring arrangements used on the scooter, for both normal use and stalled conditions. PGDT can make general recommendations for wiring for Egis Scooter Controller, but PGDT accepts no responsibility for, and accepts no liability for losses of any kind arising from, the actual wiring arrangement used.

The scooter manufacturer is responsible for ensuring that only the mating connectors specified by PGDT on the control system's specific data sheet are used to connect to the controller. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

The scooter manufacturer is responsible for ensuring that suitable connectors are used and securely mated throughout the scooter wiring system and that the workmanship associated with the wiring system is of a good enough quality. Failure to meet this condition could result in intermittent operation, sudden stopping or veering, or even create a burn or fire hazard. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition

The power connectors for the Egis controller are specially designed by PGDT for mobility applications. The crimps are standard AMP Timer parts but the plastic housings are custom. Kits of connectors can be purchased from PGDT or directly from the manufacturers, Intech.

Intech's details are as below.

Tel: +44 (0)1522 869460

Fax: +44 (0)1522 869461

The connector part numbers are:

Connector	PG Drives Technology Reference	Intech Reference
Battery	D49712 PG80-B	IPG-5202-PS
	D50287 PG80-B (High Current)	
Motor/Brake	D49925 PG80-SM	IPG-5403-S
	D50009 PG80-SM (High Current)	

Hand tools for crimping and extraction are available from Intech, the references are as below.

Crimp tool for 0.5-1.0mm² wire:	ICT-249
Crimp tool for 2.5-4.0mm² wire:	ICT-531
Crimp tool for 6.0-10.0mm² wire:	ICT-532
Extraction tool for 0.5-1.0mm² wire:	IET-503
Extraction tool for 4.0-6.0mm² wire:	IET-552

Only use the exact tools specified

The High Current reference is available for customers who wish to use a 6.0 - 10.0mm² wire gauge.

For 6.0 - 10.0mm² crimp tools please refer directly to Amp.

Good quality crimping is essential in ensuring the long term reliability of the scooter's electrical system. Poor quality crimps may initially appear to be satisfactory but, over time, they may cause problems. It is recommended that crimp quality is maintained by implementing the procedures detailed in IEC-60352-2 1990.

Defective or poor quality crimps may affect the warranty of the controller. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

For details of automatic crimp tools contact Intech.

Figures 1 and 2 give schematic details of the power connections.

3.2 Battery Connections

The controller incorporates sophisticated current limiting circuitry as protection for the circuits in the controller.

ISO 7176-14 requires you to provide protection against short circuits in the battery wiring and the power loom or the extremely unlikely event of a short circuit in the controller.

Place a suitable circuit breaker in series with the battery supply, for example in the link between two 12V batteries. If your batteries are held in separate enclosures, you must provide a circuit breaker with each of them.

The rating of the circuit breaker must match the capacity of the wiring specified in section 3.5. For Egis 70A models the circuit breaker rating should not exceed a 40A maximum rating. For Egis 110A models the circuit breaker rating should not exceed 70A.

ISO 7176-14 states that the minimum operating time for the circuit breaker when the scooter is stalled is 15 seconds.

It is recommended that the battery positive and negative wiring to the Egis is kept as short as possible

The scooter manufacturer must install a suitable circuit breaker to provide protection against short circuits in the battery wiring, power loom or the control system. Failure to comply with this could result in a fire hazard. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

3.3 Motor Connections

If a circuit breaker is fitted in series with the motor, it is essential that the scooter assumes a safe condition the moment the circuit breaker operates. You must therefore fit a circuit breaker with an auxiliary switch which inhibits the scooter from driving, see section 7.1.

3.4 Brake Connections

The solenoid brake should be a 24V type with a maximum current rating of 2A.

If the controller switches the solenoid brake and the current is less than 12mA or greater than 5A, the controller will detect a solenoid brake Trip.

3.5 Wire Gauge and Types

The table below gives the minimum recommended wire sizes for various Egis power specifications.

Egis Model	Battery Wires	Motor Wires	Brake Wires	Control Wires
70A	$4.0mm^2$	$4.0mm^2$	$0.5mm^2$	$0.22mm^2$
110A	$6.0mm^2$	$6.0mm^2$	$0.5mm^2$	$0.22mm^2$

These recommendations are derived from well proven field experience of various international scooter manufacturers. Nevertheless, it is advised that manufacturers confirm them by carrying out suitable tests. Keep wire lengths as short as possible.

If required up to 10.0mm2 wire gauge may be utilized with the High Current connecter kits. However it is advised that manufacturers carry out suitable tests. Keep wire lengths as short as possible.

Battery , motor and on-board charger (if fitted) wires should use Tri-rated PVC equipment wire rated at 105°C.

4 Batteries

The controller is designed for operation with 24 V lead acid batteries. The batteries may be wet or gel electrolyte types. Contact PGDT if you need advice on battery selection.

5 Motors

The controller is designed to be connected to permanent magnet DC motor, fitted with a suitable gearbox and solenoid brake.

In order to optimize the performance of the scooter, the controller must be matched to the motor terminal impedance. The data sheet may define a motor compensation value (normally 70% of the total motor, cable and connector resistance).

Failure to match the controller with the motors may result in poor control characteristics, in particular speed stability on gradients may be affected, see Programming and Diagnostic Technical Manual.

If you have any doubts about the suitability of a particular motor type or you need advice on measuring motor impedance, contact PGDT.

6 Control Connections

The control connections are via a 14 way Molex Microfit 3.0 connector. The mating crimps and connector housing are Molex types 43030-0007 and 43025-1400 respectively. PGDT can supply these parts or Molex can be contacted directly. An optional rubber sealing boot is available for the connector, please contact PGDT for details.

Each control connection is described below. Refer also to the connection diagrams, Figures 1 and 2, and the controller data sheet.

6.1 24V, 0.5A Fused

Pin 1 is a battery positive supply for low current electrical circuits in the tiller. It is protected by a 0.5A self-resetting fuse within the Egis controller. Higher fuse ratings may be possible, please contact PGDT

6.2 On/Off Switch

Pin 8 is the battery positive supply to the controller from the on/off switch. The maximum power consumption of the controller via this connection will not exceed 1A.

The scooter wiring should be of sufficient gauge to ensure the voltage difference between Pin 1 and Pin 8 is less than 0.25V. If auxiliary circuits, such as lighting, are deriving their power from Pin 1, then it is absolutely essential that attention is given to the gauge of the wire used.

This connection should have no external capacitance connected to it, and care should be taken not exceed the fuse rating if lights or other auxiliary functions are connected.

Large capacitances connected between pin 5 and 0V may affect the ability of the S-drive to switch on or off reliably. If it is desired to connect a large capacitance, for example to damp a battery gauge voltmeter or to suppress a horn sounder, then connection should be made between battery 24V (pin 1) and 0V.

6.3 Throttle Potentiometer

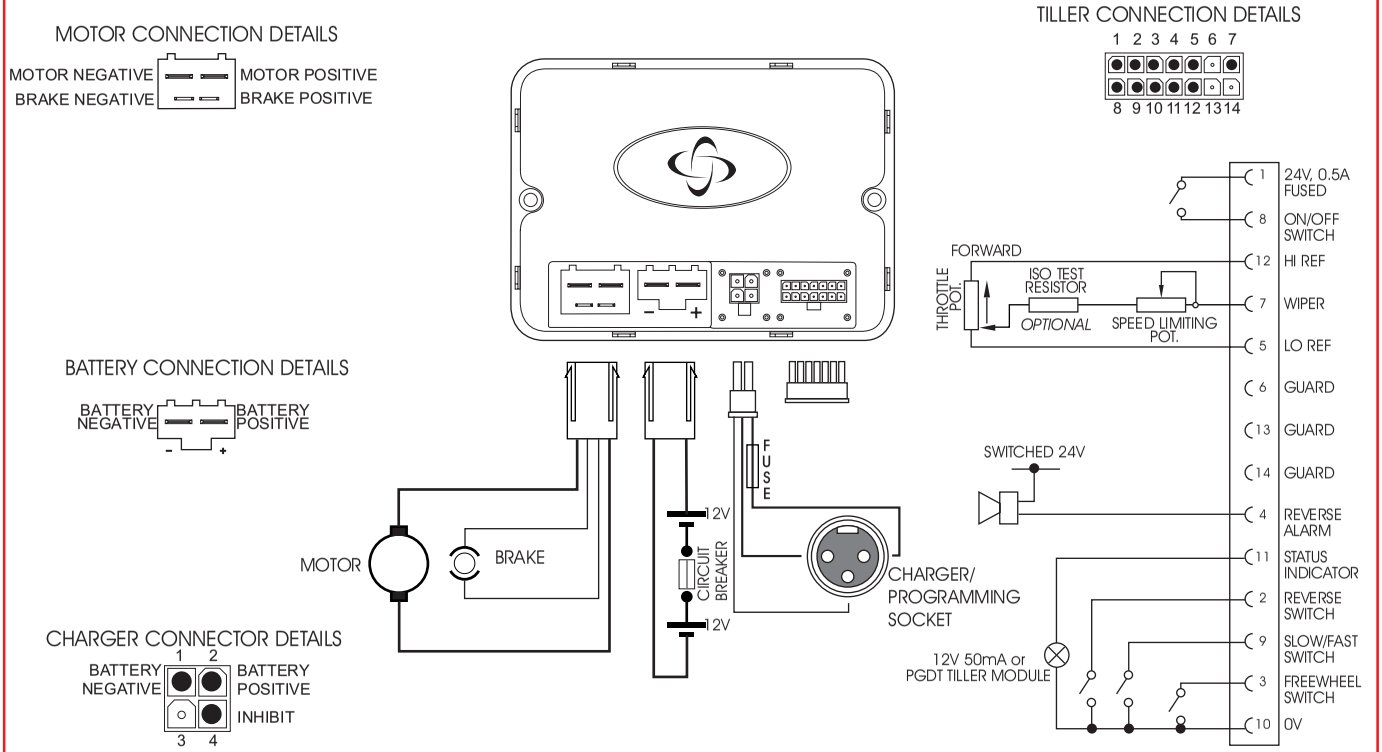
Pins 5, 7 and 12 are the connections to the throttle potentiometer. Both wig-wag (center off) and single-ended throttle configurations can be used but you should ensure the controller is programmed to the correct type, refer to the SP1 Programming and Diagnostic Technical Manual and the controller data sheet.

The value of the potentiometer should be between 2kΩ and 10kΩ ± 20%. If the full electrical span of the potentiometer is not used, a throttle gain can be programmed such that full speed can be achieved.

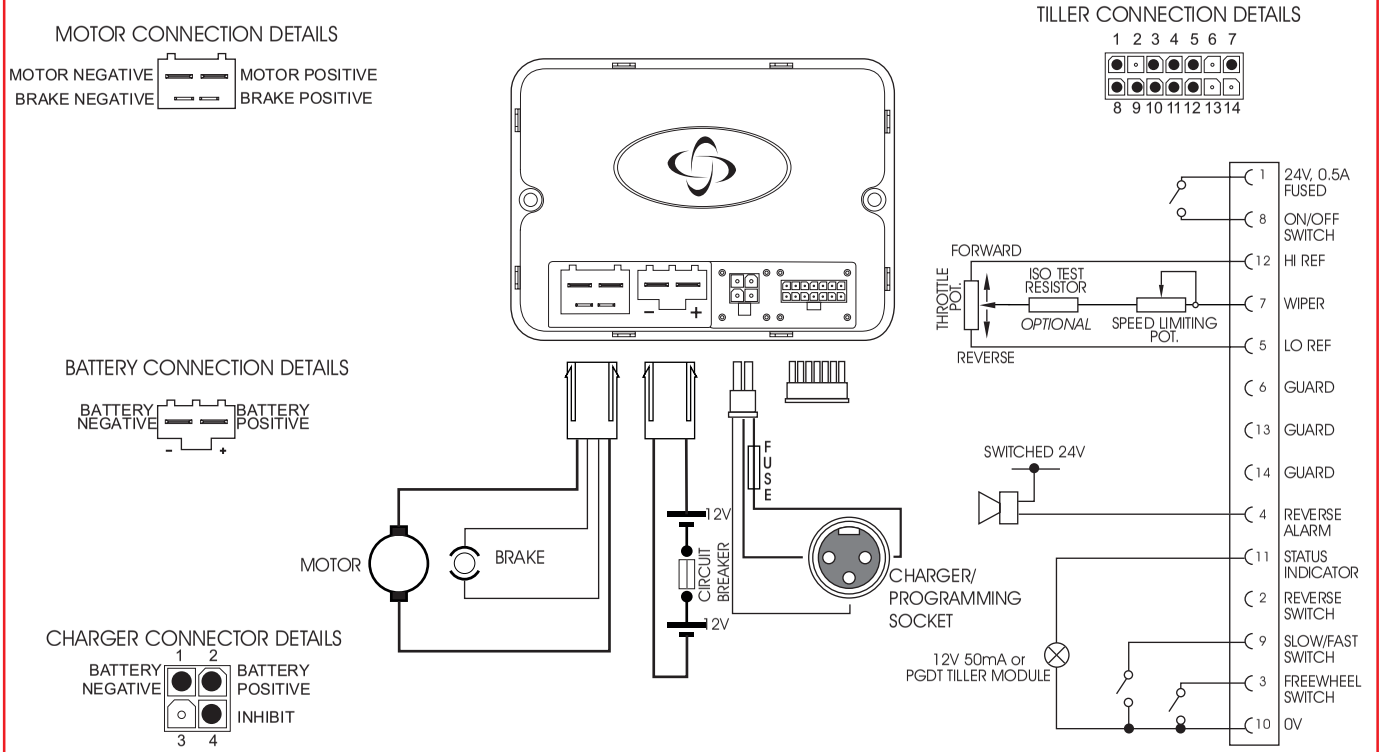
With a 25K speed limiting potentiometer the scooter's speed will be 30% of the programmed maximum speed. However, this will be affected in any of the following conditions apply:

1. An ISO test resistor is fitted.
2. A throttle mechanism with reduced mechanical travel meaning the throttle potentiometer does not reach full electrical travel.

SINGLE-ENDED EGIS CONNECTION DIAGRAM



WIG_WAG EGIS CONNECTION DIAGRAM



In case 1, the scooter's slow speed would increase to 40% of the programmed maximum speed.

In case 2, the scooter's slow speed would decrease dependent on the actual electrical travel.

There is also an interaction between the 2 cases. Therefore, to achieve the desired slow speed, a value other than 25K may be required. In selecting a different value, the following maximum limits apply.

47K if no ISO test resistor is fitted.

39K if an ISO test resistor is fitted.

Please refer to the SP1 Programming and Diagnostic Technical Manual for details.

If the scooter has a wig-wag (center off) throttle configuration it is possible, by programming, to reverse the polarity of operation of the throttle. For single ended throttles the polarity of operation of the reverse switch can be selected, refer to the SP1 Programming and Diagnostic Technical Manual.

6.3.1 Speed Limiting Potentiometer

A speed limiting potentiometer may be connected between the throttle potentiometer wiper connection and pin 7 of the controller. A resistance of 25 kΩ will limit the speed to 30% of the maximum programmed speed. It is possible to use a different value potentiometer and to achieve different speed reductions, contact PGDT for details.

6.3.2 ISO Test Resistor

In order to detect the possible throttle wiring faults as defined by ISO 7176/14, it is recommended that a 10kΩ resistor is installed as shown in the connection diagrams overleaf. This ISO Test Resistor should be located as physically close as possible to the wiper of the throttle potentiometer and the controller must be programmed to detect the resistor. Please refer to the SP1 Programming and Diagnostic Technical Manual for details.

6.3.3 Alternative Throttle Inputs

Other factory programmed throttle inputs are available such as a voltage input that accepts signals in the range of 0-5V or a unipolar wig-wag input using the reverse switch to change direction. Please contact PGDT for details.

6.4 Guard Pins

Pins 6, 13 and 14 are linked to an electronic circuit which detects the presence of electrically conductive substances, such as water or salt. If potentially hazardous levels are detected, the controller will shut down to a safe condition. No connection should be made to these pins.

6.5 Reverse Alarm

Pin 4 is an output for a 24V sounder which will operate when the scooter is being driven in reverse. The positive terminal of the sounder should be connected, via the on/off switch, to battery positive. The negative terminal of the sounder should be connected to pin 4.

The maximum current rating of the output is 50mA, you must ensure that the sounder does not draw more than this value.

The controller can be programmed to give either a continuous alarm or a pulsed alarm. This can be selected by programming, (see Programming and Diagnostic Technical Manual).

6.6 Status Indicator

This output controls either a PGDT TruCharge type status indicator or a single bulb (or LED) type status indicator.

If you are using a bulb, this must be 12V with a maximum rating of 600mW: the bulb can be connected directly between pin 11 and 0V. If you are using an LED, it is connected between the same points but you must provide a series connected current limiting resistor. For details of connection to a TruCharge type status indicator, refer to the relevant data sheet.

6.7 Reverse Switch

Pin 2 is a connection to a reverse switch. This is required to select reverse drive if the controller is being used with a single-ended throttle configuration.

The polarity of the input is programmable and can be changed using the Invert Throttle Polarity command (see Programming and Diagnostic Technical Manual).

With Invert Throttle set to NO, the drive will be in reverse if pin 2 is connected to 0V.

With Invert Throttle set to YES, the drive will be forwards if pin 2 is connected to 0V.

6.8 Slow/Fast Switch

Pin 9 is an input which can be used to limit the forward and reverse speeds, the forward and reverse acceleration and the forward and reverse deceleration of the scooter. Typical uses are: to select between indoor or outdoor use or, as is a requirement in certain countries, to limit the scooter's speed while driving on the sidewalk.

If pin 9 is connected to 0V the controller will drive using the programmed slow speeds and rates (see Programming and Diagnostic Technical Manual).

6.9 Freewheel

Pin 3 is an input which can be used to release the solenoid brake so that the scooter can be freewheeled. To release the solenoid brake pin 3 should be connected to 0V.

As a safety feature, whilst this input is active the scooter's freewheel speed is limited to 75% of the scooter's maximum driving speed.

Depending on the scooter specification, the freewheel switch can be fitted in one of two positions: firstly, on the tiller (or at another convenient point) so it can be operated directly by the person wishing to push the scooter, or, secondly, in a position such that it is operated by the solenoid brake manual disengagement mechanism. If the freewheel switch is fitted on the tiller, PGDT recommend the switch must be a momentary operation type.

If the freewheel switch is not operated by the solenoid brake manual disengagement mechanism, then an additional micro-switch which opens when the brake is disengaged should be fitted. This micro-switch should be connected in series with the solenoid brake. This interlock is to meet the requirements of ISO7176-14 which states that the scooter should not be able to drive if the solenoid brake is not engaged.

If the controller has detected a trip in either itself or elsewhere on the scooter's electrical system, then it is not possible to release the solenoid brake with the freewheel switch. In this instance, less force is required to push the scooter if it is switched off

If you have disengaged the brake and the scooter is switched off, then it may be possible for the scooter to freewheel at potentially dangerous speeds. Therefore, do not push the scooter up or down inclines on which you cannot stop or hold the scooter. Never sit on the scooter when the parking brake is disengaged. PGDT accept no liability for losses of any kind arising from the scooter being moved with the parking brake disengaged.

6.10 0 Volts

Pin 10 provides the battery negative connection to the scooter's tiller.

7 Charger Connections

The Egis controller has a dedicated connector for the battery charger. Because the charging current is routed via the controller, then the connection of a charger can be automatically detected and the actual level of charging current measured and displayed via a PGDT TruCharge type status indicator. This gives an indication of the charging status of the batteries. Refer to Chapter 1 section 10.2.2 for more details of this operation.

Ensure that a suitable fuse is connected to the Battery positive wire of the charger connection cable as shown in the Connection Diagrams in section 6.

The charger connector is a Molex Mini-Fit Junior. The mating crimps and connector housing are Molex types 44476-1112 and 39-01-2040 respectively. PGDT can supply these parts or Molex can be contacted directly. An optional rubber sealing boot is available for the connector, please contact PGDT for details.

The maximum charging current via this connector is 12A RMS.

For pin-out details of this connector, refer to the connection diagrams, Figures 1 and 2, and the controller data sheet.

This connector also provides communications to the programmer.

7.1 Inhibit

The Egis controller has a versatile input that can be configured to provide inhibit functions. This input is referred to as Inhibit and is located on the 4 way charger connector (Pin 4).

Inhibit 1 is programmed primarily to detect a charger inhibit condition, such as an off board charger being connected to the scooter or an onboard charger being connected to the line.

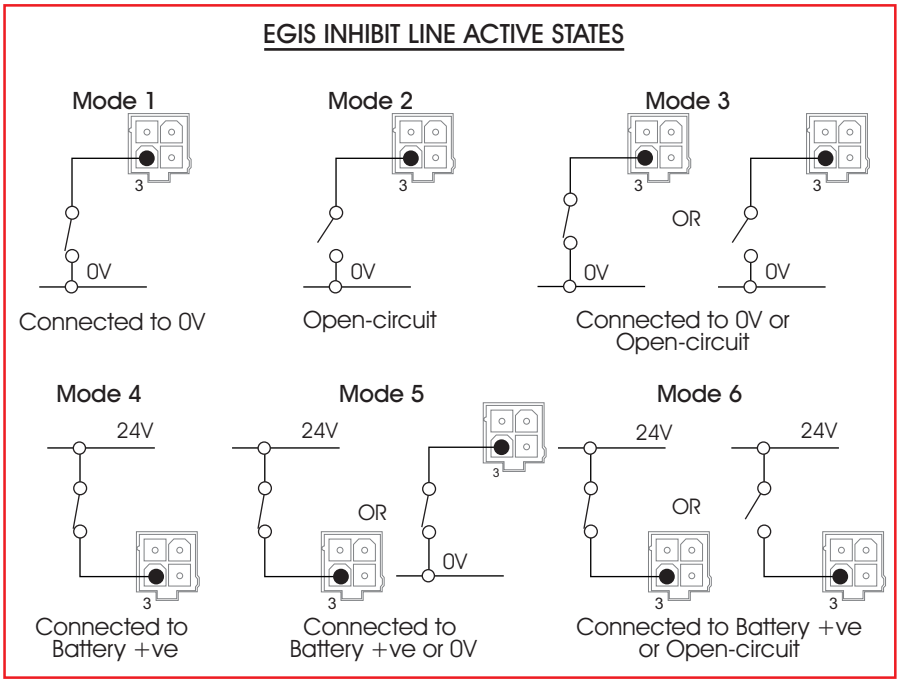
See the example in section 7.1.2

Inhibit 1 input has 2 programmable parameters.

- Inhibit Mode
- Inhibit Operation

7.1.1 Inhibit Mode

The Mode parameter refers to the state in which the inhibit is active.



7.1.2 Inhibit I Operation

The parameter can be set to one of two states:

Latched - Means the inhibitor, such as the charger plug, must be removed and the controller turned off and on before the scooter can be operated again.

Non-Latched - Means the controller can be reset to an operational state by removing the inhibitor.

If set to Latched, then when Inhibit is active the TruCharge display will step-up to indicate the scooter is charging.

Example - To provide a charge inhibit function that is active when Inhibit is connected to 0V and is latching, program as below.

Mode = 1

Operation = Latched

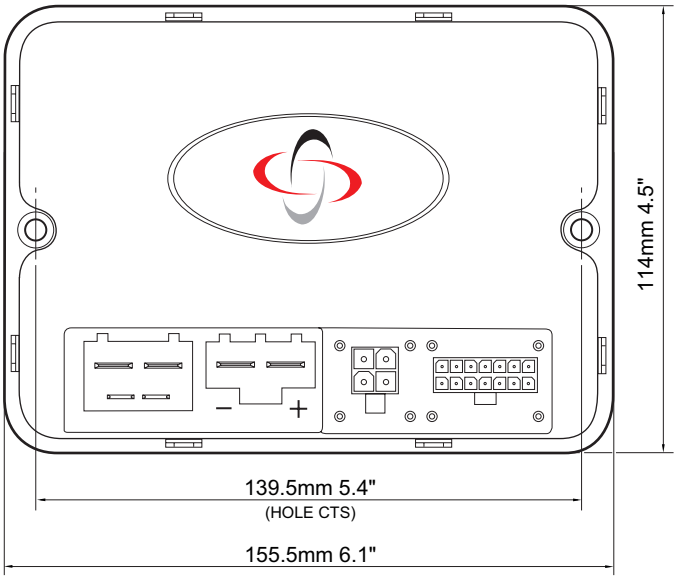
If this inhibit is activated then the controller will cause the scooter to decelerate to a complete stop (as if the throttle has been released).

8 Mounting

8.1 Orientation

The controller should be mounted so that water cannot enter and remain in the connector recesses. The recommended mounting orientation is such that the connectors must be lowermost. The function of the controller is not sensitive to mounting orientation. The electronics compartment of the controller has an IPX5 dust and water rating. Optional rubber sealing boots are available for tiller and charger/programming connector, please contact PGDT for details.

EGIS DIMENTION DIAGRAM



2 x Fixing Holes 5.5mm

8.2 Position

The controller must be mounted in a position where it is not exposed to levels of water, dust, shock or vibration above those expected on a mobility scooter application. The controller has been tested in accordance with IS07176/14 with respect to these conditions.

The controller has excellent thermal performance but, to improve this further, the base-plate may be secured against a metal part of the scooter chassis. To provide even better thermal performance, a non-silicone thermally conductive paste or pad may be applied between the base-plate and the scooter chassis.

Contact PGDT if you need further advice.

Under strenuous driving conditions it is possible for metal sections of the controller's case to exceed 41°C (106 °F) in temperature. Under such conditions, the scooter manufacturer should ensure that either the user cannot touch these surfaces, or that the user is warned not to touch these surfaces. While 41°C (106 °F) is very close to normal body temperature, prolonged contact with surfaces above 41°C (106 °F) can result in burns to the skin. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

8.3 Cables

The cables to the controller must be routed and secured in such a way as to prevent damage to them, for example by cutting or crushing.

9 Production Tests

Perform the following tests, in order, on each scooter before dispatch.

These tests should be conducted in an open space and a restraining device such as a seat belt should always be used. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

9.1 Mounting

Make sure that the controller is securely mounted. Do not overtighten any securing screws.

9.2 Cables and Connectors

Check all cables and connectors for damage. Make sure that all connectors are securely mated.

9.3 Preset Settings

Make sure that the controller is using the preset settings. Refer to the Programming and Diagnostic Manual for detailed instructions.

Controllers are always supplied with the settings shown on the relevant data sheet.

9.4 Operational Test

This test should be carried out on a level floor with at least one meter clear space around the scooter.

- Switch on the scooter.
- Check that the status indicator remains on, or flashes slowly, after half a second.
- Go to drive the scooter slowly in the forwards direction until you hear the solenoid brake operate. The scooter may start to move.
- Immediately release the throttle. You must be able to hear the solenoid brake operate within a few seconds.
- Repeat the test in the reverse direction.

9.5 Test Drive

Drive the scooter and make sure that it operates correctly for all positions of the user controls.

10 Electromagnetic Compatibility (EMC)

The Egis controller series has been tested for compliance with EC directive 89/336/EEC, and the EMC requirements of EN12184, the FDA and the FCC. The guidelines in this section will help you to make sure that your scooter installation will easily meet the requirements of the directive. You should consider EMC and perform relevant tests as early as possible in the design phase.

10.1 Emissions

A typical scooter and Egis installation have been type tested and have passed the requirements of CISPR 11 and FCC CFR47 part 15.

Observe the following recommendations to minimize radio frequency emissions:

10.1.1 Motor suppression

Solder a suitable suppression capacitor between the brush holders of the motor, inside the motor case. Keep the lead length as short as possible. We recommend a value of 4.7nF 250V AC ceramic. The maximum value you should use is 10nF. A typical type is Roderstein WY0472MCMCF0K.

10.1.2 Cables

You do not need to use screened battery and motor looms, but:

- Keep the length of all wiring to a minimum.
- Make sure the loop area of the wiring is minimized. Route the positive and negative wires to each motor together. Route the battery positive and negative wires together. Where possible, route the battery and motor looms together.
- Secure the motor and battery looms to the scooter chassis over as much of their length as is practical.
- Do not use the controller connectors as junction points for the battery connections. Separate junction points away from the Egis should be provided for the other scooter electrical functions.

10.2 Immunity

The Egis controller has been stringently tested for susceptibility to electromagnetic radiation over the frequency range 26MHz to 1GHz. The installations passed the FDA requirements and the proposed requirements of EN12184.

Follow the recommendations in section 10.1.2 to ensure maximum immunity to electromagnetic radiation.

10.3 Electro-Static Discharge (E.S.D.)

There are various international standards currently under development for this aspect of the system's performance. At present, most of the standards are specifying the system to be tested to requirements of IEC801-2 Severity Level 3. Tests are carried out at 8kV air discharge (to non-conductive surfaces) and 6kV contact discharge (to conductive surfaces).

E.S.D. produces very fast pulses of electrical energy which, if allowed to enter an

electronic system, may cause disruption of operation or even permanent damage. The Egis controller incorporates extensive protection against E.S.D., however, you should take the following precautions to prevent high levels of energy entering the controller.

The area where E.S.D. is most likely to enter the system is the tiller. Users who have become "charged", for example by walking on a nylon carpet, can impart a significant discharge to the scooter via the first point they touch. The best method of protection against such a discharge is to make all user controls and tiller enclosures non-conductive. Switch manufacturers should be able to provide appropriate advice and design rules.

Where controls and enclosures are conductive, a low impedance electrical connection to the main mass of the scooter's metalwork should be provided. If such a connection is used, it should be kept as short as possible to minimize its electrical inductance.

If such a low impedance connection cannot be made because of electrical isolation requirements then an alternative electrical connection should be provided via a varistor. For 24V systems a suitable device is manufactured by Harris, type GE-MOV V82ZA2. The varistor should be connected between the electrical terminal and battery negative.

Charger socket, battery and motor terminals do not normally require protection.

If you need advice please contact PGDT.

11 Battery Gauge

Refer to Chapter 1 sections 8 and 10 for how to read the battery gauge.

The battery gauge typically starts to flash slowly when the battery voltage falls below 23.3V whilst the scooter is driving on a level surface. The controller can be programmed to inhibit the low battery flash, please refer to SP1 Programming and Diagnostic Technical Manual.

For optimum accuracy of the battery gauge and low battery indicator, the controller should be programmed with the approximate nominal capacity of the scooter battery. However, accuracy is not greatly affected if the programmed type and capacity do not closely match the battery.

The most important factor affecting the accuracy of the battery gauge is the resistance of the cable and connections between the battery and the controller. The controller must be matched approximately to the cable resistance of your scooter to make the battery gauge accurate, (see Programming and Diagnostic Technical Manual).

As a guide, 2.5 mm^2 cable has a resistance of about 8 mΩ per meter; 4 mm^2 cable has about 5 mΩ per meter and 6 mm^2 has about 3.3 mΩ per meter. Circuit breakers and connectors usually account for about 15 mΩ.

These values will be chosen at the time the controller is being specified by the scooter manufacturer. Like the preset acceleration rates, once the values for the battery are decided, they are programmed into controllers during manufacture and should never need changing.

If you need advice, contact PGDT.

CHAPTER 3
TILLER MODULE

1 Introduction

Study Chapters 1 & 2, they describe the intended functionality of the Tiller Module and the details for connection to the Egis Controller.

The Egis Status Indicator parameter will require adjustment before the TruCharge indicator will work correctly. Refer to the SpIb Pragramming and Diagnostic Technical Manual.

There are two variants of the Tiller Module. These are:

- Surface mount variant.
- Inset variant.

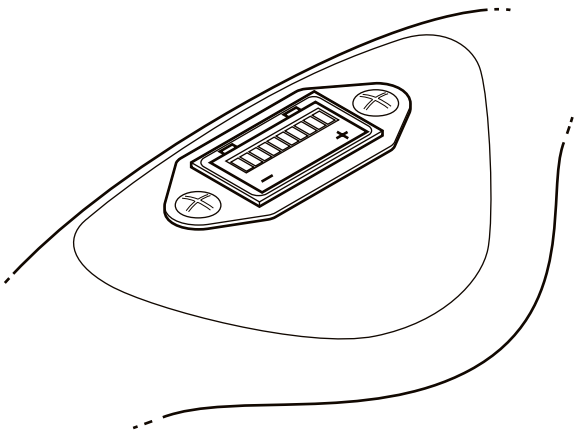
1.1 Surface Mount Variant

The Surface Mount variant attaches to the tiller module from the outside (See the following illustration). The electronics compartment of the Tiller Module has an IPX5 dust and water rating.

- Surface mount variants - D50133

D50133 consists of: 1 TruCharge Display Module, 1 TruCharge Display Cable, and 1 Gasket

EGIS TILLER MODULE - SURFACE



1.2 Inset Variant

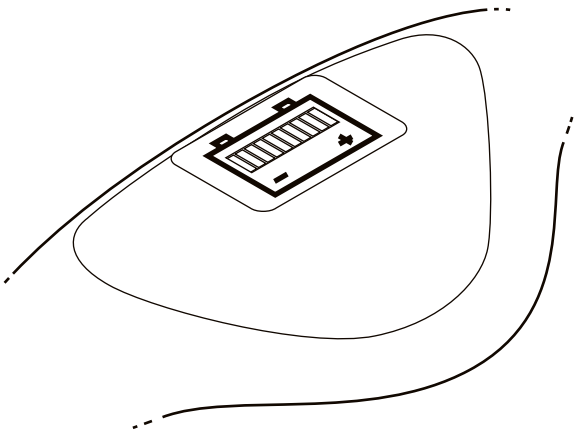
The Inset variant must be embedded within the Scooter Tiller's housing(See the following illustration). The electronics of the controller will then take on the dust and water rating of the Scooter Tiller.

- Inset variant - D50066 / D50032

D50066 Consists of: 1 TruCharge Display Module, 1 Label and 1 Double-sided Adhesive Gasket.

D50032 Consists of: 1 TruCharge Display Module and 1 Double-sided Adhesive Gasket.

EGIS TILLER MODULE - INSET

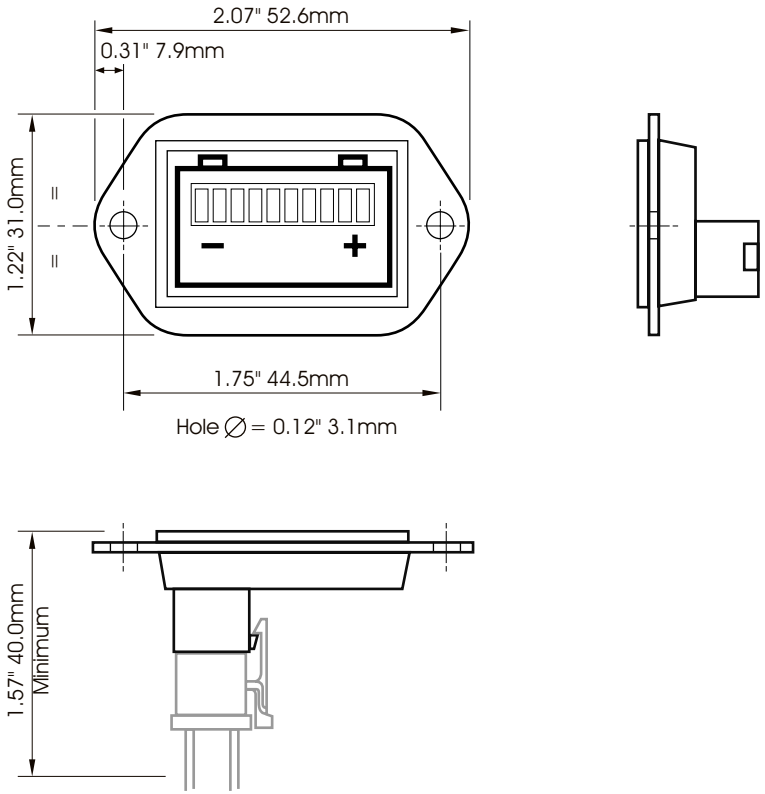


2 Dimensions

2.1 Surface Mount Variant

The Surface Mount Tiller Module has the dimensions shown in the following illustration.

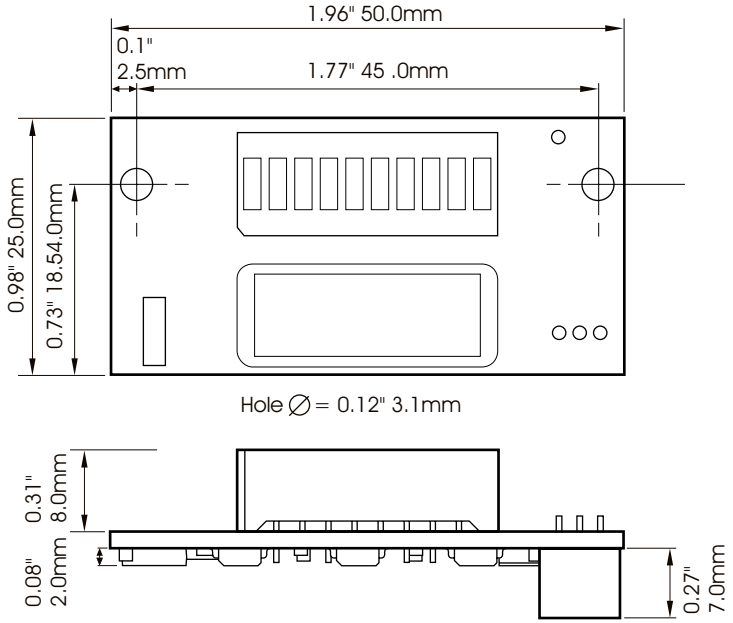
EGIS TILLER MODULE DIMENSIONS - SURFACE



2.2 Inset Variant

The Inset Tiller Module has the dimensions shown in the following illustration.

EGIS TILLER MODULE DIMENSIONS - INSET



3 Mounting

3.1 Handling

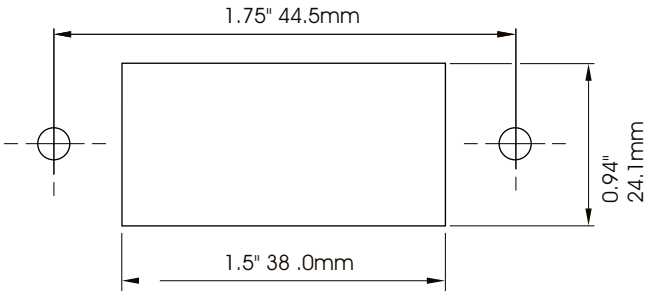
The Tiller Module contains electronic components which may be sensitive to static electricity. Always store the modules in the original packaging until they are ready to be used. When the modules are removed from the packaging, ensure correct anti-static precautions are taken.

3.2 Surface Mount Variant

3.2.1 Fixing

The scooter's Tiller should be fitted with holes as suggested in the diagram below.

EGIS TILLER MODULE FIXING HOLES - SURFACE



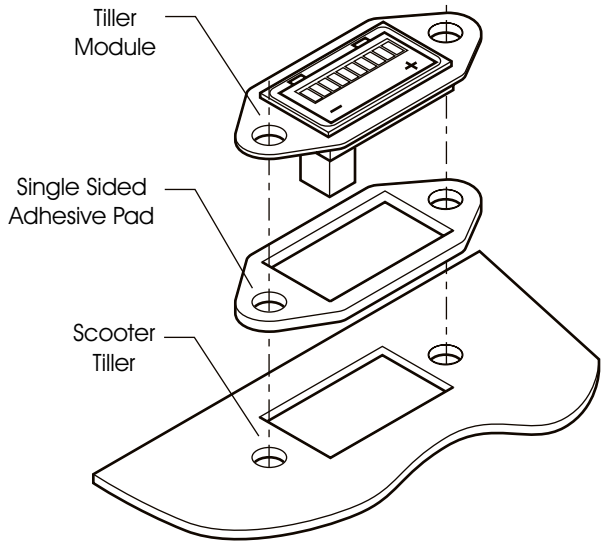
Hole ∅ = 0.12" 3.1mm

3.2.2 Sealing

The supplied single-sided adhesive gasket should be used to create a seal between the Tiller Module and the scooter's control panel. See the following illustration

When correctly fitted this arrangement will give the Tiller Module an IPX5 dust and water rating.

EGIS TILLER MODULE MOUNTING - SURFACE



3.3 Inset Variant

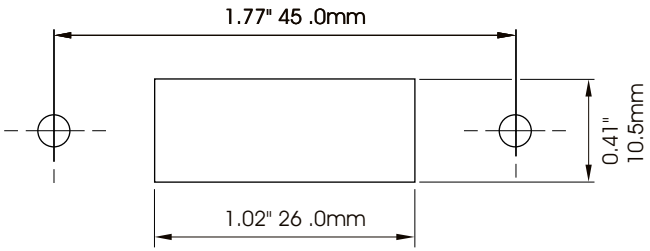
3.3.1 Fixing

The scooter's control panel should be fitted with holes as suggested in the diagram below.

The supplied double-sided adhesive pad should be used to secure the Tiller Module to the scooter's control panel. See the following illustration.

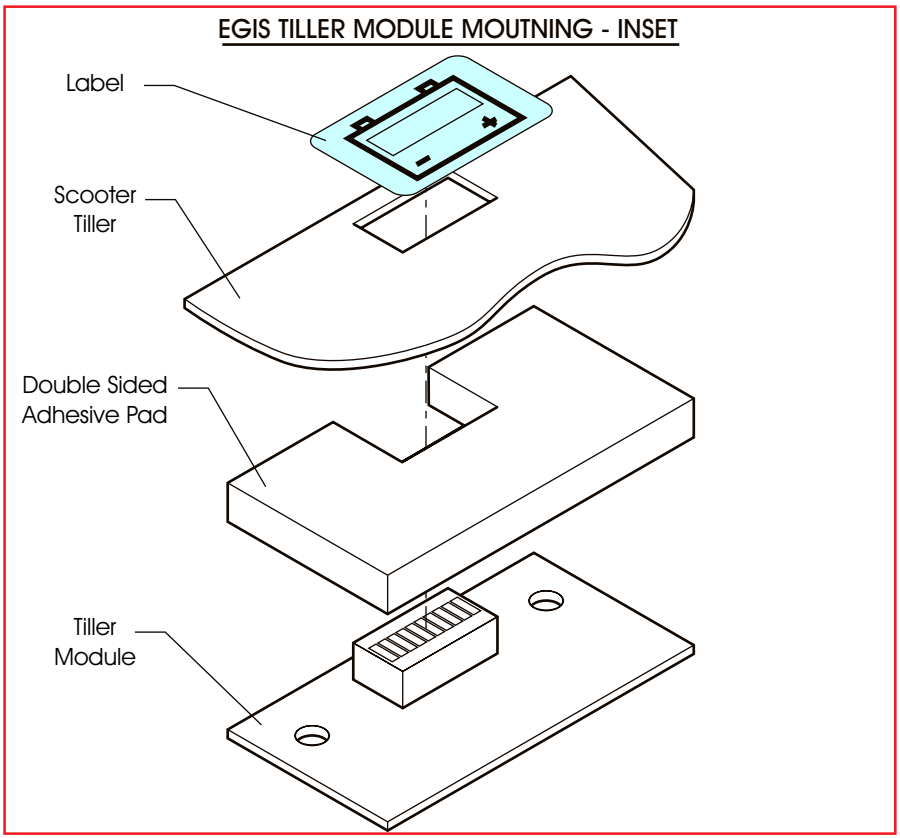
If the Adhesive pad is being used to attach the Tiller Module then the screw holes either side of the central rectangle will not be required.

EGIS TILLER MODULE FIXING HOLES - INSET



Alternatively M3 (4-40 UNC) hardware can be used. The height of the display from the printed circuit board is 8.0mm (0.31"). Suitable spacers should be used so that the display is fixed slightly below the scooter's control panel. Ensure that the metallic fixing hardware (nuts, washers etc.) do not touch the conductive tracks on the printed circuit board.

3.2.2 Sealing



The module should be sealed against the ingress of water and dust by a placing an adhesive waterproof overlay over the display cut-out. The overlay should contain a suitably sized transparent window and the overall dimensions should be at least 36.0mm x 20.5mm (1.41" x 0.81")

The sealing label is only supplied with the Tiller Module kit number D50066.

4 Wiring

You are responsible for establishing the suitability of the particular wiring arrangement used on the scooter. PG Drives Technology can make general recommendations for wiring to Tiller Modules, but PG Drives Technology accepts no responsibility for the wiring arrangement used.

4.1 Wire Gauge

The minimum recommended wire size is 0.22mm^2 for all connections.

4.2 Connectors

4.2.1 Surface Mount Variant

The Tiller Module is fitted with a Molex 'Mini-fit jr' 4 way connector.

See www.molex.com for your local distributor.

Part Numbers are as follows:

Molex 'Mini-Fit-Jr.' 4 socket receptacle:	39-01-2040

PG Drives Technology TruCharge Display Cable.

PGDT Part number:	SA76199

Only use the PG Drives Technology TruCharge Display Cable number SA76199 supplied with kit D50133.

Hand tools for crimping and extraction are available from Molex. The references are as below.

Molex 'Mini-Fit-Jr.' Crimp tool:	69008-0724
Molex 'Mini-Fit-Jr.' Extraction tool:	11-03-0044

Only use the exact tools specified.

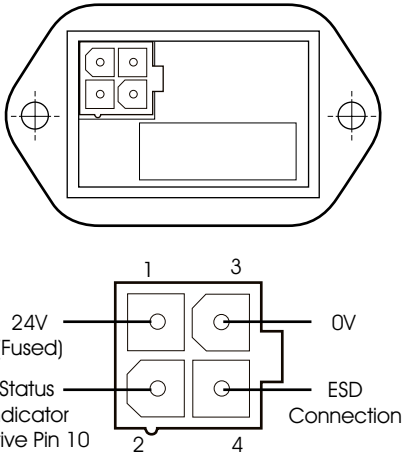
4.2.2 Inset Variant

The Tiller Module is fitted with a 3 way AMP CT series connector, part number 175487-3. The mating crimps and connector housing have Amp part numbers 179227-1 and 179228-3 respectively. Only these parts should be used.

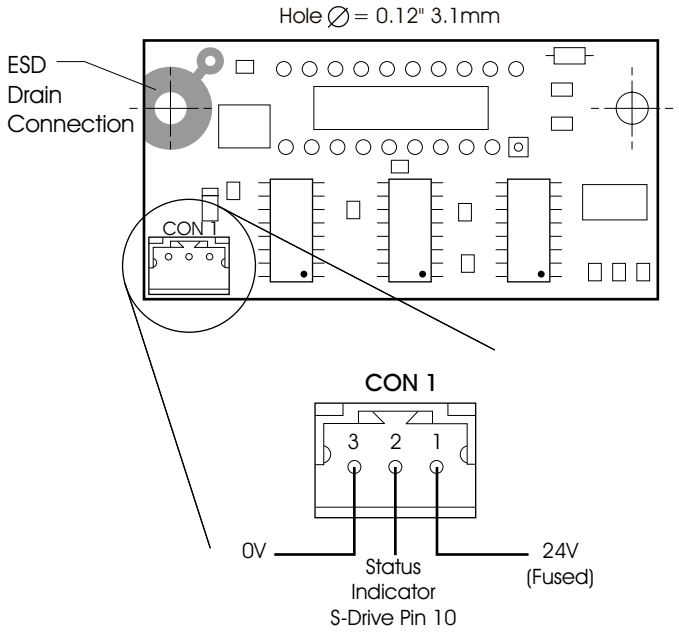
There is also a solder/ring tag point for an Electro-Static Discharge (ESD) drain path wire.

5 Connections

EGIS TILLER MODULE CONNECTION - SURFACE



EGIS TILLER MODULE CONNECTION - INSET



5.1 Controller Connections

Tiller Module Type	Tiller Module Connector	Function	Tiller Interface
Inset	1	24V	Pin 1
Inset	2	Status Indicator	Pin 11
Inset	3	0V	Pin 10
Surface	1	24V	Pin 1
Surface	2	Status Indicator	Pin 11
Surface	3	0V	Pin 10
Surface	4	ESD	--

5.2 ESD Connection

5.2.1 Surface Mount Variant

This is an optional connection and may not be required, refer to section 6.2 for details.

If the connection is required then connection point 4 in the Molex 'Mini-fit jr' 4 way connector must be utilized

5.2.2Inset Mount Variant

This is an optional connection and may not be required, refer to section 6.2 for details.

If the connection is required there are two methods available. Firstly, a solder hole for wires or electrical suppression components. Secondly, if screws are used to secure the Tiller Module, then a ring terminal can be used.

6 Electromagnetic Compatibility (EMC)

The controller has been tested for compliance with EC directive 89/336/EEC, and the EMC requirements of prEN12184, the FDA and the FCC. The guidelines in this section will help you to make sure that your scooter installation will easily meet the requirements of the directive. You should consider EMC and perform relevant tests as early as possible in the design phase.

6.1 Immunity and Emissions

Refer to the Electromagnetic Compatibility section in the controller's technical manual.

6.2 Electro-Static Discharge (E.S.D.)

The tiller is the most vulnerable area on the scooter to electro-static discharges. These discharges may cause disruption of operation or even permanent damage. The tiller module incorporates extensive protection against E.S.D., however, you should take the following precautions to prevent high levels of energy entering the scooter's electronic system.

- The highest degree of protection can be achieved by making the tiller enclosure, switches and other controls non-conductive. Membrane keypads in particular provide good E.S.D. protection, keypad manufacturers will be able to give appropriate design rule guidance. It should also be considered that high voltages can jump through gaps in enclosures, thereby gaining access to the electronics. Enclosures should therefore be as closed as possible.
- If controls or enclosures are conductive, a low impedance electrical connection to the scooter's metalwork should be provided. If such a connection is used, it should be kept as short as possible to minimize its electrical inductance.
- The tiller module has a connection point, ESD: this can be used to provide an ESD drain path. The path should be via a varistor connected between the ESD pin and the scooter's metalwork. A suitable device is manufactured by Harris, type GE-MOV V82ZA2.

7 Production Tests

7.1 Mounting

Make sure that the tiller module is securely mounted. Do not overtighten any securing screws.

Ensure that the adhesive sealing overlay is fully pressed down.

7.2 Cables and Connections

Check all cables and connections to the tiller module for damage. Ensure there are no dry solder joints.

7.3 Operational Test

The following tests should be carried out on a level floor with at least one meter of clear space around the scooter.

With the scooter switched off, displace the throttle and then switch the scooter on. The TruCharge display should "ripple" up and down. When you have observed that all the bars illuminate, release the throttle and the display should now become steady and indicate the battery condition.

There are two conditions when this test cannot be performed. Firstly, if the controller is programmed (Tiller Displacement on Start-up) to instantly trip if it is powered-up with the throttle displaced. Secondly, if the controller is programmed (High Pedal Disable) to drive immediately after power-up regardless of throttle position.

If this test cannot be performed due to the above conditions, then the only other test method is to power-up the scooter with fully charged batteries and check that all the TruCharge bars illuminate.

CHAPTER 4
WARNING SUMMARY

1 Introduction

This section summarizes all of the very important warnings that appear throughout the text of this manual. Do not install, maintain or operate the Egis Scooter Controller without reading, understanding and observing the following warnings. Failure to observe these warnings could result in UNSAFE CONDITIONS for the user of a scooter or affect the reliability of the controller. PG Drives Technology accepts no liability for losses of any kind arising from failure to comply with any of the conditions in the warnings listed below. Failure to observe these warnings will invalidate the Egis warranty.

The scooter manufacturer may wish to use this section as a check list, to ensure the risk areas identified below have been addressed within their own scooter designs and associated documentation.

2 Warnings

2.1 Driving Technique

The scooter user must be capable of driving a scooter safely. PGDT accepts no liability for losses of any kand arising from failure to comply with this condition. Chapter 1 Section 5.2

2.2 Precautions for Use

lthough the Egis is designed to be extremely reliable and each unit is rigorously tested during manufacture, the possibility of system malfunction always exists (however small the probability). Under some conditions of system malfunction the controller must (for safety reasons) stop the scooter instantaneously. If there is any possibility of the user falling out of the scooter as a result of a sudden braking action, it is imperative that a restraining device such as a seat belt is supplied with the scooter and that it is in use at all times when the scooter is in motion. PGDT

accept no liability for losses of any kind arising from the unexpected stopping of the scooter, or arising from the improper use of the scooter or controller.

Do not operate the scooter if it behaves erratically, or shows abnormal signs of heating, sparks or smoke. Turn the scooter off at once and consult your service agent. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

Electronic equipment can be affected by Electro Magnetic Interference (EMI). Such interference may be generated by radio stations, TV stations, other radio transmitters and cellular phones. If the scooter exhibits erratic behavior due to EMI, turn it off immediately and consult your service agent. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

It is the responsibility of the scooter manufacturer to ensure that the scooter complies with appropriate National and International EMC legislation. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

The scooter user must comply with all scooter safety warnings. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter I Section 6.1

2.3 Disengaging the Parking Brake

If you have disengaged the brake and the controller has detected a fault or the scooter is switched off, then it may be possible for the scooter to freewheel at potentially dangerous speeds. Therefore, do not push the scooter up or down inclines on which you cannot stop or hold the scooter. Never sit on the scooter when the parking brake is disengaged. PGDT accept no liability for losses of any kind arising from the scooter being moved with the parking brake disengaged. Chapter I Section 9.2

2.4 Driving

Do not operate the scooter if the battery is nearly discharged. Failure to comply with this condition may leave the user stranded in an unsafe position, such as in the middle of a road. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter 1 Section 10.2.1

2.5 Battery Charging

Do not exceed the maximum charging current for the scooter. PGDT accepts no responsibility for losses of any kind from failure to comply with this condition.

Ensure that the charger plug pins are of the correct polarity to be compatible with the scooter's charging socket. Failure to observe this condition could result in a burn hazard or a fire hazard. PGDT accepts no responsibility for losses of any kind from failure to comply with this condition.

Do not disconnect the batteries or open-circuit the circuit breaker while charging is in progress. Failure to observe this condition could result in a burn hazard or a fire hazard. PGDT accepts no responsibility for losses of any kind from failure to comply with this condition.

Only use the battery charger that has been supplied with your scooter. The use of incorrect chargers could damage the batteries, scooter, controller or charger itself, or may result in parts overheating creating the potential for burns or even fire. PGDT accepts no responsibility for losses of any kind from failure to comply with this condition. Chapter 1 Section 11

2.6 Programming

Programming should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a scooter for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values. Chapter 1 Section 12

2.7 Controller Servicing

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modifications to the Egis controller.

If the Egis controller is damaged in any way, or if internal damage may have occurred through impact or dropping, have the product checked by qualified personnel before operating. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter 1 Section 13

2.8 Warranty

The warranty will be void if the Egis has not been used in accordance with Egis Technical Manual SK75326, the Egis has been subject to misuse or abuse, or if the Egis has been modified or repaired by unauthorized persons. Chapter 1 Section 14

2.9 Program Settings

Programming should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a scooter for the user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values. PGDT accept no liability for losses of any kind if the drive or stability characteristics of the scooter are altered without prior notification and discussion with PGDT. Chapter 2 Section 1.2

2.10 Charger Interlock

The scooter manufacturer is responsible for providing a means of preventing the use of the scooter while the batteries are being charged. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter 2 Section 2.2

2.11 Connections - General

The scooter manufacturer is responsible for establishing the suitability of the particular wiring arrangements used on the scooter, for both normal use and stalled conditions. PGDT can make general recommendations for wiring for Egis Scooter Controller, but PGDT accepts no responsibility for, and accepts no liability for losses of any kind arising from, the actual wiring arrangement used.

The scooter manufacturer is responsible for ensuring that only the mating connectors specified by PGDT on the control system's specific data sheet are used to connect to the controller. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

The scooter manufacturer is responsible for ensuring that suitable connectors are used and securely mated throughout the scooter wiring system and that the workmanship associated with the wiring system is of a good enough quality. Failure to meet this condition could result in intermittent operation, sudden stopping or veering, or even create a burn or fire hazard. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

Defective or poor quality crimps may affect the warranty of the controller. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter 2 Section 3.1

2.12 Battery Connections

The scooter manufacturer must install a suitable circuit breaker to provide protection against short circuits in the battery wiring, power loom or the control system. Failure to comply with this could result in a fire hazard. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter 2 Section 3.2

2.13 Freewheel

If you have disengaged the brake and the scooter is switched off, then it may be possible for the scooter to freewheel at

potentially dangerous speeds. Therefore, do not push the scooter up or down inclines on which you cannot stop or hold the scooter. Never sit on the scooter when the parking brake is disengaged. PGDT accept no liability for losses of any kind arising from the scooter being moved with the parking brake disengaged. Chapter 2 Section 6.9

2.14 Position

Under strenuous driving conditions it is possible for metal sections of the controller's case to exceed 41°C (106 °F) in temperature. Under such conditions, the scooter manufacturer should ensure that either the user cannot touch these surfaces, or that the user is warned not to touch these surfaces. While 41°C (106 °F) is very close to normal body temperature, prolonged contact with surfaces above 41°C (106 °F) can result in burns to the skin. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter 2 Section 8.2

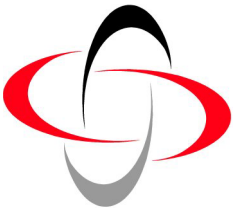
2.15 Production Tests

This test should be conducted in an open space and a restraining device such as a seat belt should always be used. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter 2 Section 9.

CHAPTER 5
SPECIFICATIONS

I Electrical Specifications

Supply Voltage:	24Vdc
Operating Voltage:	16Vdc to 30Vdc
Peak Voltage:	38Vdc
Reverse Battery Current:	40Vdc
Output Current:	70A / 110A
Throttle Input:	Wig-Wag, Single-ended, Voltage
PWM Frequency:	19.5kHz ± 1%
Solenoid Brake Current:	2A max.
Status Output:	12V, 50mA source
Reverse Alarm Output:	24V, 50mA sink
Bat. Charging Current:	12A rms max.
Moisture Resistance:	IPX4
Operating Temperature:	-25°C to +50°C
Storage Temperature:	-40°C to +65°C
Safety:	Multiple hardware and software stratergy designed to ISO7176/14
EMC tested on sample wheelchair:	
Susceptibility:	Tested at 30V/m to EN12184 and ANSI/ RESNA requirements
Emissions:	To EN55022 Class B
ESD:	IEC801 part 2
Enviromental Resistance:	Electronics to IP65



PG DRIVES TECHNOLOGY

SPIA

PROGRAMMER FOR SOLO, EGIS AND S-DRIVE CONTROLLERS

PROGRAMMING AND DIAGNOSTICS

SK73762/6

TABLE OF CONTENTS

About this manual

This manual is split into 6 chapters which are in turn split into separate sections. Each chapter deals with a specific issue.

Chapter 1 - Programming

This chapter gives an overview of the programmable parameters which the SP1a can adjust.

Chapter 2 - Diagnostic

This chapter deals general diagnostic processes.

Chapter 3 - Solo Diagnostics

This chapter deals specific trip types and codes pertaining wto the Solo Controller.

Chapter 4 - Egis Diagnostics

This chapter deals specific trip types and codes pertaining wto the Egis Controller.

Chapter 5 - S-Drive Diagnostics

This chapter deals specific trip types and codes pertaining wto the S-Drive Controller.

Chapter 6 - Warning Summary

This chapter gives a sumary of all the warnings used within the manual

ICONS

PG Drives Technology. will be abbreviated to PGDT throughout the manual.

Throughout the manual icons are used to draw the reader's attention.

The icons used are:

Note - A general point for best practice.

Caution - A point of safety which if ignored could result in damage to the control system or the vehicle.

Warning - A point of safety which if ignored could cause injury to the individual.

CHAPTER I
PROGRAMMING

1 Introduction

The main advantage of using programmable controllers is that they can be easily tailored to the specific needs and capabilities of a particular vehicle while taking into account safe performance characteristics.

The programmable controller achieves this great flexibility by referring to a set of internal parameters which govern factors such as the vehicle's speed, acceleration and braking. These parameters can be changed over a wide span to suit different vehicles and users, using a simple, hand-held programmer.

If you are using the SP1a programmer with a DT125 controller, please contact PGDT for more information.

It is possible to set up a controller so that it is unsuitable for some uses and possibly even some vehicles. Take care when programming a controller and if you need any advice in programming or selecting values, please contact PGDT.

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values.

1.1 Use of a SP1a with Solo, Egis, and S-Drive

In general all SP1a Programmers can be used with DT125, Solo, Egis, and S-Drive controllers. However, depending on the exact version of SP1a you have, then some functions may not be available.

If you are using the SP1a programmer with a DT125 controller, please contact PG Drives for more information.

You can identify your SP1a by looking at the type number. This will be either D49371/x, or D50040/x, where x is the release version of the firmware.

Different versions of the SP1a are fitted with a different connectors. These are:

SP1a (Solo)	D49371/x
SP1a (Egis/S-Drive)	D50040/x

Adapters are available. For all connection details refer to section 3.1.

Earlier SP1a programmers are not configured to program the additional parameters in the S-Drive or Egis controllers.

The following table summarizes the full compatibility between the SP1a versions and the Solo, Egis, and S-Drive controllers.

Function	Controller Compatibility			SP1a Version	
	Solo	Egis	S-Drive	D50040	D49371
Forward Acceleration	❍	❍	❍	All	All
Forward Deceleration	❍	❍	❍	All	All
Reverse Acceleration	❍	❍	❍	All	All
Reverse Deceleration	❍	❍	❍	All	All
Max Fwd Speed	❍	❍	❍	All	All
Min Fwd Speed			❍	3 Onwards	7 Onwards
Max Rev Speed	❍	❍	❍	All	All
Min Rev Speed			❍	3 Onwards	7 Onwards
Invert Throttle	❍	❍	❍	All	All
Sleep Timer	❍	❍	❍	All	All
Read System Log		❍(1)	❍	3 Onwards	7 Onwards
Read Timer		❍	❍	3 Onwards	7 Onwards

1 Not Controllers manufactured before Sept 2002

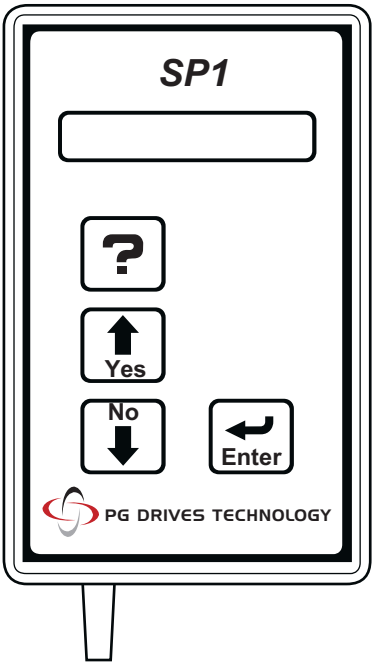
2 The SP1a Programmer

The SP1a is a handheld programmer for use with PG Drives Technology Solo, Egis and S-Drive controllers. Primarily intended for general purpose use, it can set all of the key controller speed, acceleration and braking characteristics, and allows different settings to be tried out while the programmer is still plugged into the controller.

The programmer is a menu-driven device which plugs directly into the controller and has a context-sensitive help function available to guide users through the menus. The SP1a can also display error messages from the controller which allows any problems with the vehicle electrical system to be identified and corrected quickly.

The SP1a takes advantage of the programmability of the controller, offering functions not available with less sophisticated controller designs.

SP1A KEYPAD LAYOUT



?	Help Button:	Pressing this button displays information regarding the function you have selected. In menus, HELP tells you what each option does. In options, it tells you what to do next.
Yes	Up / Yes Button:	This button steps up through the menu lists, increases the value of settings and selects functions
No	Down / No Button:	This button steps down through the menu lists, decreases the value of settings and de-selects functions
Enter	Enter Button:	This button selects options, settings and function states.

2.1 Important Note

Adjusting the controller's parameters to non-compatible values could damage both the controller and motors, and invalidate any warranties. Contact PG Drives Technology if there is the slightest doubt. On a more general note, it is possible to set up a controller so that it is unsuitable for some users or even some vehicles.

In addition, the SP1a programmer should not be connected to a controller when the vehicle batteries are being charged. The high voltages present during charging may damage the programmer.

If you need any advice on programming, please do not hesitate to contact PGDT.

3 Using The SPIa

Please read this guide carefully before using the SP1a Programmer.

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values.

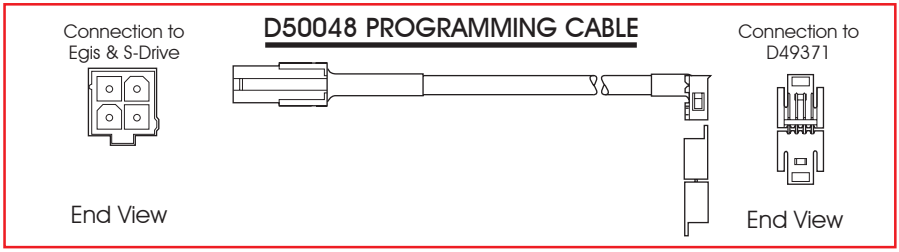
3.1 Connection

The SP1a can be connected to the controller when the controller is either on or off. You can also drive with the SP1a connected.

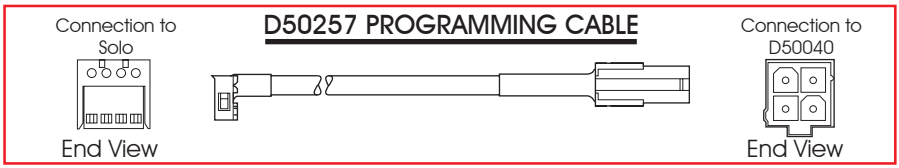
For safety reasons, accessing some critical parameters will cause the controller to trip. This is intentional and the controller can be simply reset by switching off then on again.

Different versions of the SP1a are fitted with different connectors.

D49371 programmers are designed to program Solo controllers, but can be used to program Egis and S-Drive controllers by adding adaptor D50048.



D50040 programmers are designed to program Egis and S-Drive controllers, but can be used to program Solo controllers by adding adaptor D50257.



Earlier SPIa programmers are not configured to program the additional parameters in the S-Drive or Egis controllers.

3.1.1 Programming

To program, simply connect the SP1a to the controller whilst it is turned on. If the SP1a is showing diagnostic information, press the ENTER key and the SP1a will go into

programming mode.

3.1.2 Diagnostics

To use the SP1a to view Trip Codes and messages, connect it to the controller when the controller has tripped.

If a trip occurs when the SPIa is already connected, then no diagnostic information will appear.

When the SPIa is connected to a PGDT programmable controller, the electromagnetic compatibility (E.M.C.) performance of the vehicle may be affected. Disconnect the SPIa as soon as programming is complete and do not use the SPIa in environments which are E.M.C. sensitive.

4 Programming Menu

The menu, contains all the parameters which set the normal drive characteristics of the vehicle. Each parameter is explained in the following paragraphs.

4.1 Forward Accel'n ?

Adjusts the value for forward acceleration of the vehicle, in increments of 1. There are two settings:

Fast — This value is used when the vehicle's slow/fast switch is set to fast.

Slow — This value is used when the vehicle's slow/fast switch is set to slow.

The values are approximately displayed in "units" of 100ms and correspond to the time taken to reach full forward speed from standstill, i.e. the higher the value the slower the acceleration.

If there is no Slow/Fast switch fitted then only the Fast value will be relevant.

Setting this value too high could cause the scooter to tip when accelerating up a slope.

4.2 Forward Decel'n ?

Adjusts the value for forward deceleration (or braking) of the vehicle, in increments of 1. There are two settings:

Fast — This value is used when the vehicle's slow/fast switch is set to fast.

Slow — This value is used when the vehicle's slow/fast switch is set to slow.

The values are approximately displayed in "units" of 100ms and correspond to the time taken to reach standstill from full forward speed, i.e. the higher the value the slower the deceleration.

It is the responsibility of the scooter manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184.

4.3 Reverse Accel'n ?

Adjusts the value for reverse acceleration of the vehicle, in increments of 1. There are two settings:

Fast — This value is used when the vehicle's slow/fast switch is set to fast.

Slow — This value is used when the vehicle's slow/fast switch is set to slow.

The values are approximately displayed in "units" of 100ms and correspond to the time taken to reach full reverse speed from standstill, i.e. the higher the value the slower the acceleration.

If there is no Slow/Fast switch fitted then only the Fast value will be relevant.

4.4 Reverse Decel'n ?

Adjusts the value for reverse deceleration (or braking) of the scooter, in increments of 1. There are two settings:

Fast — This value is used when the scooter's slow/fast switch is set to fast.

Slow — This value is used when the scooter's slow/fast switch is set to slow.

The values are approximately displayed in "units" of 100ms and correspond to the time taken to reach standstill from full reverse speed, i.e. the higher the value the slower the deceleration.

It is the responsibility of the scooter manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184.

Setting this value too high could cause the scooter to tip when stopping whilst reversing down a slope.

4.5 Max Forward Speed ?

This sets the MAXIMUM forward speed of the scooter. There are two available settings.

Fast — This value is used when the slow/fast switch is set to fast.

Slow — This value is used when the slow/fast switch is set to slow.

The value is displayed as a percentage of the scooters total available output. Therefore if the Fast value is set to 80% then the scooter will be able to drive at up to 80% of the total available speed when the Slow/Fast switch is in the Fast position.

If there is no Slow/Fast switch fitted then only the Fast value will be relevant.

Ensure the stability of the scooter is maintained, especially when cornering, at the programmed Max Forward Speed.

4.6 Min Forward Speed ?

This sets the MINIMUM forward speed of the scooter.

For this parameter to operate, a Speed Limiting Potentiometer must be fitted and correctly programmed. The Speed Limiting Potentiometer must be fitted in Parallel. Under these conditions there are two available settings.

Fast	This value is used when the scooter's Speed Limiting potentiometer is set to Slow and the Slow/Fast switch is set to Fast.
Slow	This value is used when the scooter's Speed Limiting potentiometer is set to Slow and the Slow/Fast switch is set to Slow.

The value is displayed as a percentage of the scooters total available output. Therefore if the Fast value is set to 40% then the scooter will be able to drive at up to 40% of the total available speed when the Slow/Fast switch is in the Fast position and the Speed Limiting Potentiometer is in the Slow position.

If there is no Slow/Fast switch fitted then only the Fast value will be relevant.

4.7 Max Reverse Speed ?

This sets the MAXIMUM reverse speed of the scooter.

So long as a Slow/Fast switch is fitted to the scooter then there are two available settings.

Fast	This value is used when the slow/fast switch is set to fast.
Slow	This value is used when the slow/fast switch is set to slow.

The value is displayed as a percentage of the scooters total available output. Therefore if the Fast value is set to 60% then the scooter will be able to drive at up to 60% of the total available speed when the Slow/Fast switch is in the Fast position.

If there is no Slow/Fast switch fitted then only the Fast value will be relevant.

4.8 Min Reverse Speed ?

This sets the MINIMUM reverse speed of the scooter.

For this parameter to operate, a Speed Limiting Potentiometer must be fitted and correctly programmed. The Speed Limiting Potentiometer must be fitted in Parallel, refer to Chapter 2 section 4.2. Under these conditions there are two available settings.

Fast	This value is used when the scooter's Speed Limiting potentiometer is set to Slow and the Slow/Fast switch is set to Fast.

Slow — This value is used when the scooter's Speed Limiting potentiometer is set to Slow and the Slow/Fast switch is set to Slow.

The value is displayed as a percentage of the scooters total available output. Therefore if the Fast value is set to 20% then the scooter will be able to drive at up to 20% of the total available speed when the Slow/Fast switch is in the Fast position and the Speed Limiting Potentiometer is in the Slow position.

If there is no Slow/Fast switch fitted then only the Fast value will be relevant.

4.9 Invert Throttle ?

This selects the polarity of operation of a wig-wag throttle or, on a single-ended throttle system, the polarity of operation of the reverse switch. You can set the Throttle Invert Polarity to Yes or No.

On a wig-wag system, setting Throttle Invert Polarity to No means that if throttle potentiometer wiper is approaching the high reference then direction will be forwards, Yes is opposite to this.

On a single-ended type system, No means that if the reverse switch input is connected to 0V then direction will be reverse, Yes is opposite to this.

4.10 Sleep Timer ?

A length of time can be set, such that if the controller accepts no valid input for that period of time, it will power down safely. The time can be set from 0 to 20 minutes. If the value is set to 0, no power down will occur.

To operate the scooter after the controller has entered sleep mode switch the controller of and on again.

4.11 Read System Log ?

Displays a diagnostic log which stores the number of occurrences of the last eight detected system problems. Refer to the specific chapter for the controller conected to the SP1a.

4.12 Read Timer ?

Displays the length of time which the controller has been driven. The value is displayed in complete hours.

CHAPTER 2
DIAGNOSTICS

1 Introduction

The primary objective of this chapter is to assist service personnel in finding the likely area of a detected fault within the whole scooter electrical system. It is important to realize that even though the controller is signaling a fault, it may not be the controller itself that is defective. This is because the controller is able to detect problems in other electrical components (motors, batteries, solenoid brakes etc.) or, more importantly, the wiring to them. When a controller has detected a fault, a system trip is indicated.

This chapter covers diagnostics of scooters fitted with PG Drives Technology Solo, Egis and S-Drive controllers. For a basic diagnostic capability it is not necessary to have a programmer to use this guide, as all these controllers have a sophisticated level of on-board diagnostics.

Using this guide, it is possible to define a trip as belonging to one of 10 types. Once this type has been established, there are suggestions as to what the possible cause may be.

This chapter should only be used to decide the starting point of your own diagnosis, as it is possible for the controller to indicate a trip in another component even though the controller itself may be defective. Nevertheless, experience has shown that connectors and wiring are the major cause of scooter electrical problems, so it is necessary to examine these more vulnerable areas first.

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair.

1.1 Diagnostics Process

For efficient and effective diagnosis the following basic steps should be taken.

- Establish the type of controller fitted to the scooter.
- Confirm there is a trip, or has been an intermittent trip. Refer to section 2.
- Establish the trip type. Refer to section 3.
- Refer to the trip table for the controller you are working with. Refer to Chapters 3, 4 & 5 dependant on controller type..
- Refer to the possible cause as indicated by the trip table, and carry out recommended investigative and corrective action. Refer to Chapters 3, 4 & 5 dependant on controller type.

2 Detecting a Trip has Occurred

Depending on how the controller is programmed and the setup of the scooter a trip will be identified in one of two ways.

- Via the TruCharge Indicator.
- Via the LED or single Lamp indicator.

The TruCharge indicator operates in the following manner.

2.1 Flashing Rapidly

The controller is tripped. To determine the trip type, refer to section 3. Connecting a programmer to the controller while this is happening will give you a trip code.

2.2 Flashing Slowly

No trip is currently detected by the controller. The slow flash is an indication that the batteries require charging.

A trip may have occurred previously, refer to Chapter 1 section 4.11 for details of how to read the controller's system log, then section 3.1 to establish the trip type.

2.3 Display is Steady

The controller is not currently tripped.

A trip may have occurred previously, refer to Chapter 1 section 4.11 for details of how to read the controller's diagnostic log, then section 3.1 to establish the trip type.

2.4 Display Does Not Illuminate

No power is reaching the controller. Ensure the batteries are fully charged and that all connections between batteries and the controller are made. If these connections are good, then the controller may be defective, refer to Section 7.

To see how the Single Lamp (or LED) indicators operate, depending on the controller type, refer to section 3.2.

3 Trip Diagnosis

Depending on the type of status indicator fitted to the vehicle - single bulb (or LED) or TruCharge battery and diagnostics indicator - there are two methods of trip diagnosis.

3.1 Trip Diagnosis with a TruCharge Display Type Status Indicator

This section is only applicable if the vehicle is fitted with a PGDT TruCharge battery and diagnostics indicator.

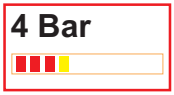
If you look at the below diagram you will see that 10 different types of trip are defined. The number of bars flashing rapidly on the TruCharge display indicates the trip type. A description for each trip type is given in Chapters 3, 4 & 5 dependant on controller type.

3.1.1 TruCharge Display Diagnostics

Low Battery Voltage

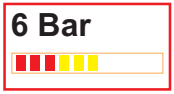
Motor Disconnected

Motor Wiring Trip

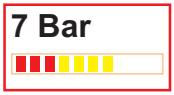


Parking Brake Off.

Not used.



Inhibit Active



Throttle Potentiometer Trip

Possible Controller Trip

Solenoid Brake Trip

High Battery Voltage

3.2 Trip Diagnosis with a single bulb (or LED) type status indicator

3.2.1 Solo Controllers & Egis prior to 2002

If the vehicle is not fitted with a TruCharge type status indicator you will need a PGDT SP1 Programmer to determine the trip type.

You must connect the SP1 to the controller whilst the status indicator is flashing rapidly, a trip message will then be displayed on the SP1's screen. As an example, assume that the wires to the solenoid brake have been disconnected, the message displayed would be as below.

Diagnosis…. **Code 1500: solenoid brake trip - check brakes and connections. Press enter to continue.**

From the above, you can see there is a 4 digit number - this is known as the trip code, in this case 1500.

When this code is used in conjunction with the specific Trip Table in Chapter 3, you can determine the trip type, 1 to 10. The trip types and their possible causes are described in more detail in Chapter 3.

3.2.2 Egis Controllers

If the Egis controller with a single lamp (or LED) has been programmed accordingly then the Trip Code will be displayed in a flash sequence.

Example: **If the controller detects a Motor Wiring Trip then the single lamp (or LED) will flash three times, pause, and then flash three times, and so on. The flash sequence represents the Trip Code which would be displayed if a TruCharge module was fitted.**

When this code is used in conjunction with the specific Trip Table in Chapter 4, you can determine the trip type, 1 to 10. The trip types and their possible causes are described in more detail in Chapter 4.

3.2.3 S-Drive Controller

If the Egis controller with a single lamp (or LED) has been programmed accordingly then the Trip Code will be displayed in a flash sequence.

Example: **If the controller detects a Motor Wiring Trip then the single lamp (or LED) will flash three times, pause, and then flash three times, and so on. The flash sequence represents the Trip Code which would be displayed if a TruCharge module was fitted.**

When this code is used in conjunction with the specific Trip Table in Chapter 5, you can determine the trip type, 1 to 10. The trip types and their possible causes are described in more detail in Chapter 5.

3.3 Trip Diagnosis with the SP1a programmer

You can also use a PG Drives Technology SP1a Programmer to determine the exact trip type.

To do this you must connect the SP1a to the controller whilst the status indicator is flashing rapidly, a trip message will then be displayed on the SP1a's screen. As an

example, assume that the wires to the solenoid brake have been disconnected, the message displayed would be as below.

> Diagnosis…. Code 1500: solenoid brake fault - check brakes and connections. Press enter to continue.

From the above, you can see there is a 4 digit number - this is known as the trip code, in this case 1500.

When this code is used in conjunction with the controller specific trip tables in chapetrs 3, 4 and 5, you can determine the trip type, 1 to 10.

CHAPTER 3
SOLO DIAGNOSTICS

1 Introduction

This chapter is to be used in relation to Solo controllers only. It describes the specific Solo trip types and their meanings, aswell as giving remedy suggestions.

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair.

2 Solo Trip Table

Trip Code	Trip Type	Description
0810	7	Throttle Trip. Ref to Section 3.7
1400	3	Motor Wiring Trip. Ref to Section 3.3
0A00	Blink	Sleep Mode. Ref to section 3.11
1500	9	Solenoid Brake Trip. Ref to Section 3.9
1502	9	Solenoid Brake Trip. Ref to Section 3.9
1600	10	High Battery Voltage. Ref to Section 3.10
1D02	7	Throttle Trip. Ref to Section 3.7
1E03	6	Inhibit Active. Ref to Section 3.6
2C00	1	Low Battery Voltage. Ref to Section 3.1
2C01	1	Low Battery Voltage. Ref to Section 3.1
3B01	2	Motor Disconnected. Ref to Section 3.2
7000	4	Freewheel Mode Engaged. Ref 3.4
7001	4	Freewheel Mode Engaged. Ref 3.4
All Others	8	Possible Controller Trip

If any other trip code is experienced, please contact PG Drives Technology for further details.

3 Trip Types and Their Possible Causes

Once the trip type has been established, refer to the relevant section below for further information.

1 Bar

The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, try charging the battery.

2 Bar

There is a bad connection to the motor. Check all connections between the motor and the controller.

3 Bar

The motor has a short circuit to a battery connection. Contact your service agent.

4 Bar

The freewheel switch is activated or the manual brake disengagement mechanism is operated. Check the position of the switch or lever. Check the controller voltage. Refer to 3.4.

5 Bar

Not used.

6 Bar

The controller is being inhibited from driving, this may be because the battery charger is connected or the seat is not in the driving position. Check the controller voltage. Refer to 3.6.

7 Bar

A throttle trip is indicated. Make sure that the throttle is in the rest position before switching on the scooter. Check the controller voltage. Refer to 3.7.

8 Bar

A controller trip is indicated. Make sure that all connections are secure. Contact your service agent.

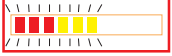
9 Bar

There is a bad connection to the parking brake. Check all connections between the parking brake and the controller. Check the controller voltage. Refer to 3.9.

10 Bar

An excessive voltage has been applied to the controller. This is usually caused by a poor battery connection. Check the battery connections. Check the controller voltage. Refer to 3.10.

Blink



The controller has entered sleep mode. Switch the scooter off and on again.

3.1 Trip Type 1 - Low Battery Voltage

This occurs when the controller detects that the battery voltage has fallen below 16V. Check the condition of the batteries.

If the trip is still present after the batteries and connections have been checked, then the controller may be defective. Refer to section 5.

3.2 Trip Type 2 - Motor Disconnected

This occurs when the controller detects that the motor has become disconnected. Check the motor connectors and wiring.

Some vehicles may disconnect the motor from the controller whilst in freewheel mode. If so, check the position of the parking brake disengage lever.

If the trip is still present after the above checks have been made, then the controller may be defective. Refer to section 5.

3.3 Trip Type 3 - Motor Wiring Trip

This occurs when the controller detects a trip in the wiring to the motor, in particular if a motor connection has "short-circuited" to a battery connection. Check the motor connectors and wiring.

If the trip is still present after the above checks have been made, then the controller may be defective. Refer to section 5.

3.4 Trip Type 4 - Parking Brake Off

This occurs if the freewheel switch is operated whilst the vehicle is driving, or if the freewheel switch is already operated when the vehicle is switched on. Check the position of the freewheel switch.

If the freewheel switch is in the correct position, then the voltage on a correctly functioning system the voltage should be as below. If the voltages are incorrect then check the wiring to the freewheel switch.

P2 - Pin 8 : 0V $\pm$ 0.5V to freewheel

5V $\pm$ 0.5V to drive

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

3.5 Trip Type 5 - Not Used

3.6 Trip Type 6 - Inhibit Active

This occurs when the controller detects that the input is activated. The most common use for the inhibit input is for disabling the vehicle's drive when the battery charger is connected. Check that the battery charger is disconnected.

If the charger is disconnected, then the voltage should be checked. Depending on whether the controller is programmed to active low or active high inhibit, then on a correctly functioning system the voltage should be as below. If the voltages are incorrect then check the wiring to charger socket or other inhibit source.

Active low inhibit:	P2- pin 6	0V ± 0.5V to inhibit
		5V ± 0.5V to drive
Active high inhibit:	P2- pin 6	0V ± 0.5V to drive
		5V ± 0.5V to inhibit

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

3.7 Trip Type 7 - Throttle Trip

This occurs if the controller detects a trip in the throttle potentiometer or the connections to it.

The following voltage measurements can be made for either a potentiometer input throttle or voltage input throttle. Check that the throttle is in the rest position and any speed limiting pots or buttons are set to maximum speed. The nominal voltage levels should be as follows:

Wig-wag throttle:	Hi Ref to BATT –ve: nominal 4.75V	(P2 - pin 1)
	Wiper to BATT –ve: nominal 2.5V	(P2 - pin 3)
	Lo Ref to BATT –ve: nominal 0.25V	(P2 - pin 2)
Single-ended throttle:	Hi Ref to BATT –ve: nominal 4.75V	(P2 - pin 1)
	*Wiper to BATT –ve: nominal 0.25V	(P2 - pin 3)
	Lo Ref to BATT –ve: nominal 0.25V	(P2 - pin 3)

* If the 10 kΩ ISO Test resistor is used with single ended throttle, the nominal value at Wiper is 0.188V

If the throttle input is functioning correctly and the trip is still present, then the controller may be defective. Refer to section 5.

3.8 Trip Type 8 - Possible Controller Trip

This occurs when the controller detects a trip within itself. The controller must be assumed defective and repaired by an authorized person. Refer to section 5.

3.9 Trip Type 9 - Solenoid Brake Trip

This occurs when the controller detects a trip in the solenoid brake or the connections to it. Check these connections and the solenoid brake. On a correctly functioning system, the following voltage levels should be present.

P2 pins 13 to 14:	0V ± 0.5V, when the throttle is at rest.
	Battery voltage ± 1V, when the throttle is away from rest.

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

The above voltage measurements should be carried out with the vehicle's drive wheels raised above the ground. Read the vehicle manufacturer's instructions regarding the jacking up of the vehicle.

3.10 Trip Type 10 - High Battery Voltage

This occurs when the controller detects that the battery voltage has risen above 38V for a 24V controller or above 42V for a 36V controller. The most common reasons for this are overcharging of the battery or bad connections between the controller and the batteries. Check the batteries and the connections to them.

If the trip is still present after the batteries and connections have been checked, then the controller may be defective. Refer to section 5.

3.11 Blink - System Asleep

To use the scooter once it has been immobilised by the Sleep Timer function, turn the scooter off and on again.

4 Other Trip Symptoms

This section covers trips which are not displayed on the status indicator by the controller. This may be because: either the controller cannot switch on; the trip is not considered critical enough to "trip" the controller; or the controller cannot detect the condition. None of these types of trips would present a hazard to the vehicle user.

4.1 System Will Not Switch On

With the on/off switch and keyswitch (if fitted) in the on position, check the voltage at of the controller connections, P2 - pin 5.

For controller to operate, the voltage at the specified pin should be equal to battery positive ± 0.25V. If this voltage is present and the vehicle will not switch on, then the controller may be defective. Refer to section 5.

4.2 Vehicle Drives Slowly

If you think the controller has been programmed differently from the manufacturer's presets, check the programmed values. If these appear to be correct, then carry out the following checks.

Firstly, check that the solenoid brake is not jammed. Refer to the vehicle manufacturer's instructions to see how to do this.

Secondly, check the voltage at the controller's slow/fast input. On a correctly functioning system the voltage should be as below. If the voltages are incorrect then check the wiring and connectors to the slow/fast switch.

P2 - pin 7:	0V ± 0.5V for slow mode
	5V ± 0.5V for fast mode

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

4.3 Status Indicator Does Not Light

If the vehicle appears to be operating correctly but the status indicator does not light, then check the wiring and connectors from the controller's status indicator output to the status indicator itself.

On a correctly functioning system with a fully charged battery, the voltage on status indicator output should be 12V ± 1V P2 - pin 12. If this voltage is not present even when there is no connection to the controller, then the controller may be defective. Refer to section 5.

4.4 Reverse Alarm Does Not Sound

If the reverse alarm does not sound, firstly check the wiring and connectors from the controller's reverse alarm output and the sounder itself, P2 - pin 11.

4.5 Vehicle Will Not Drive in Reverse

This section is only applicable to vehicles fitted with single-ended throttle configurations. If the vehicle does not drive in reverse and the reverse switch is in the correct position,

then the voltage at reverse input should be checked. Depending on whether the controller is programmed to non-inverting or inverting throttle polarity (refer to Chapter 1 section 4.9), then on a correctly functioning system the voltage at reverse input should be as below. If the voltages are incorrect then check the wiring and connectors to the freewheel switch.

Non-inverting throttle:

P2 - pin 9 : 0V ± 0.5V to drive in reverse
5V ± 0.5V to drive forwards

Inverting throttle:

P2 - pin 9 : 0V ± 0.5V to drive forwards
5V ± 0.5V to drive in reverse

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

4.6 Motor or Brake Becomes Very Warm

The motor will become very warm if it is being overloaded. One cause maybe that the solenoid brake is jamming. To check this, refer to the vehicle manufacturer's instructions.

4.7 Batteries Discharge Very Quickly

The batteries can discharge very quickly for several reasons, these are listed below.

- Worn or damaged batteries - check battery condition.
- Charger defective or incorrect charger being used - check charger operation type (refer to vehicle operating instructions).
- Incorrect batteries being used - refer to vehicle manufacturer's instructions for correct battery types.
- Solenoid brake jamming - see section 4.6.

The ambient temperature has a significant effect on battery capacity. Therefore, if the temperature is lower than normal the vehicle's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading.

5 Servicing of Defective Units

There are no serviceable parts within the controller. Consequently, any defective units must be returned to PGDT or a PGDT approved service organization for repair.

Opening or making any unauthorized adjustments or modifications to the controller or its components will invalidate any warranty and may result in hazards to the vehicle user, and is strictly forbidden.

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modification to the controller.

CHAPTER 4
EGIS DIAGNOSTICS

1 Introduction

This chapter is to be used in relation to Egis controllers only. It describes the specific Egis trip types and their meanings, as well as giving remedy suggestions.

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair.

2 Egis Trip Table

Trip Code	Trip Type	Description
0810	7	Throttle Trip. Ref to section 3.7
0814	7	Throttle Trip. Ref to section 3.7
0815	7	Throttle Trip. Ref to section 3.7
0816	7	Throttle Trip. Ref to section 3.7
0817	7	Throttle Trip. Ref to section 3.7
1D02	8	Throttle Trip. Ref to section 3.7
0A00	Blink	Sleep Mode. Ref to section 3.11
1500	9	Open Circuit in Solenoid Brake Circuit. (3.9)
1501	9	Short Circuit in Solenoid Brake Circuit. (3.9)
1502	9	Overcurrent Solenoid Brake Circuit. (3.9)
1600	10	High Battery Voltage. Ref to section 3.10
1D02	7	Throttle Trip. Ref to section 3.7
1E03	6	Inhibit Active. Ref to section 3.6
2C00	1	Low Battery Voltage. Ref to section 3.1
2C01	1	Low Battery Voltage. Ref to section 3.1
2F01	7	Throttle Displaced Trip. Ref to section 3.12
3B01	2	Motor Disconnected. Ref to section 3.2
7000	4	Freewheel Mode Engaged. Ref 3.4
7001	4	Freewheel Mode Engaged. Ref 3.4
All Others	8	Possible Controller Trip

If any other trip code is experienced, please contact PG Drives Technology for further details.

3 Trip Types and Their Possible Causes

Once the trip type has been established, refer to the relevant section below for further information.

1 Bar

The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, try charging the battery.

2 Bar

There is a bad connection to the motor. Check all connections between the motor and the controller.

3 Bar

The motor has a short circuit to a battery connection. Contact your service agent.

4 Bar

The freewheel switch or manual brake disengagement mechanism are operated. This is instigated only on systems where there is a switch wired to the Egis' Freewheel input.Check the position of the switch. Refer to 3.4.

5 Bar

Not used.

6 Bar

The controller is being inhibited from driving, this may be because the battery charger is connected or the seat is not in the driving position. Check the controller voltage. Refer to 3.6.

7 Bar

A throttle trip is indicated. Make sure that the throttle is in the rest position before switching on the scooter. Check the controller voltage. Refer to 3.7.

8 Bar

A controller trip is indicated. Make sure that all connections are secure. Contact your service agent.

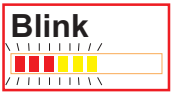
9 Bar

There is a bad connection to the parking brake. Some scooters will register this error type when the freewheel lever is disengaged. First of all, check the freewheel lever is in the drive position, then check all connections between the parking brake and the controller. Refer to 3.9.

10 Bar

An excessive voltage has been applied to the controller. This is usually caused by a poor battery connection. Check the battery connections. Check the controller voltage. Refer to 3.10.

Blink



The controller has entered sleep mode. Switch the scooter off and on again.

3.1 Trip Type 1 - Low Battery Voltage

This occurs when the controller detects that the battery voltage has fallen below 16V. Check the condition of the batteries.

If the trip is still present after the batteries and connections have been checked, then the controller may be defective. Refer to section 5.

3.2 Trip Type 2 - Motor Disconnected

This occurs when the controller detects that the motor has become disconnected. Check the motor connectors and wiring.

Some vehicles may disconnect the motor from the controller whilst in freewheel mode. If so, check the position of the parking brake disengage lever.

If the trip is still present after the above checks have been made, then the controller may be defective. Refer to section 5.

3.3 Trip Type 3 - Motor Wiring Trip

This occurs when the controller detects a trip in the wiring to the motor, in particular if a motor connection has "short-circuited" to a battery connection. Check the motor connectors and wiring.

If the trip is still present after the above checks have been made, then the controller may be defective. Refer to section 5.

3.4 Trip Type 4 - Parking Brake Off

This occurs if the freewheel switch is operated whilst the vehicle is driving, or if the freewheel switch is already operated when the vehicle is switched on. Check the position of the freewheel switch.

If the freewheel switch is in the correct position, then the controller may be defective. Refer to section 5.

3.5 Trip Type 5 - Not Used

3.6 Trip Type 6 - Inhibit Active

This occurs when the controller detects that the input is activated. The most common use for the inhibit input is for disabling the vehicle's drive when the battery charger is connected. Check that the battery charger is disconnected.

If the charger is disconnected, then the voltage should be checked. Depending on whether the controller is programmed to active low or active high inhibit, then on a correctly functioning system the voltage should be as below. If the voltages are incorrect then check the wiring to charger socket or other inhibit source.

Active low inhibit:	Charger- pin 4 :	0V ± 0.5V to inhibit
		5V ± 0.5V to drive
Active high inhibit:	Charger- pin 4:	0V ± 0.5V to drive
		5V ± 0.5V to inhibit

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

3.7 Trip Type 7 - Throttle Trip

This occurs if the controller detects a trip in the throttle potentiometer or the connections to it.

Specific trip codes relate to different scenarios and these are detailed below.

Trip Code 0814: Throttle High Reference (pin 12) Disconnected.

Trip Code 0815: Throttle Low Reference (pin 5) Disconnected or Short Circuit between Throttle High and Low References (Pins 12 & 5) or Throttle Potentiometer is Incorrect Value.

Trip Code 0816: Short Circuit between Throttle Wiper and Throttle High Reference (Pins 7 & 12)

Trip Code 0817: Short Circuit between Throttle Wiper and Throttle Low Reference (Pins 7 & 5)

Trip Code 1D02: A Throttle Parameter setting has been adjusted. Restart controller to clear the trip.

Check that the throttle is in the rest position and any speed limiting pots or buttons are set to maximum speed. The nominal voltage levels should be as follows:

Wig-wag throttle:	Hi Ref(pin 12) to BATT-ve nominal 4.75V Wiper(pin 7) to BATT-ve nominal 2.5V Lo Ref(pin 5) to BATT-ve nominal 0.25V
Single-ended throttle:	Hi Ref(pin 12) to BATT-ve nominal 4.75V *Wiper(pin 7) to BATT-ve nominal 0.25V Lo Ref(pin 5) to BATT-ve nominal 0.25V

* If the 10 kΩ ISO Test resistor is used with single ended throttle, the nominal value at Wiper is 0.188V

If the throttle input is functioning correctly and the trip is still present, then the controller may be defective. Refer to section 5.

3.8 Trip Type 8 - Possible Controller Trip

This occurs when the controller detects a trip within itself. The controller must be assumed defective and repaired by an authorized person. Refer to section 5.

3.9 Trip Type 9 - Solenoid Brake Trip

This occurs when the controller detects a trip in the solenoid brake, the connections to it or when the Freewheel lever is disengaged. Check these connections, the solenoid brake and the Freewheel Lever. On a correctly functioning system, the following voltage levels should be present.

Brake + to Brake-: 0V ± 0.5V, when the throttle is at rest.
Battery voltage ± 1V, when the throttle is away from rest.

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

The previous voltage measurements should be carried out with the vehicle's drive wheels raised above the ground. Read the vehicle manufacturer's instructions regarding the jacking up of the vehicle.

3.10 Trip Type 10 - High Battery Voltage

This occurs when the controller detects that the battery voltage has risen above 38V for a 24V controller or above 42V for a 36V controller. The most common reasons for this are overcharging of the battery or bad connections between the controller and the batteries. Check the batteries and the connections to them.

If the trip is still present after the batteries and connections have been checked, then the controller may be defective. Refer to section 5.

3.11 Blink - System Asleep

To use the scooter once it has been immobilised by the Sleep Timer function, turn the scooter off and on again.

4 Other Trip Symptoms

This section covers trips which are not displayed on the status indicator by the controller. This may be because: either the controller cannot switch on; the trip is not considered critical enough to trip the controller; or the controller cannot detect the condition. None of these types of trips would present a hazard to the vehicle user.

4.1 System Will Not Switch On

With the on/off switch and keyswitch (if fitted) in the on position, check the voltage at of the controller connections, pin 8.

For controller to operate, the voltage at the specified pin should be equal to battery positive ± 0.25V. If this voltage is present and the vehicle will not switch on, then the controller may be defective. Refer to section 5.

4.2 Vehicle Drives Slowly

If you think the controller has been programmed differently from the manufacturer's presets, check the programmed values. If these appear to be correct, then carry out the following checks.

Firstly, check that the solenoid brake is not jammed. Refer to the vehicle manufacturer's instructions to see how to do this.

Secondly, check the voltage at the controller's slow/fast input. On a correctly functioning system the voltage should be as below. If the voltages are incorrect then check the wiring and connectors to the slow/fast switch.

Tiller - pin 9:	0V ± 0.5V for slow mode
	5V ± 0.5V for fast mode

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

4.3 Status Indicator Does Not Light

If the vehicle appears to be operating correctly but the status indicator does not light, then check the wiring and connectors from the controller's status indicator output to the status indicator itself.

On a correctly functioning system with a fully charged battery, the voltage on status indicator output should be 12V ± 1V pin 11. If this voltage is not present even when there is no connection to the controller, then the controller may be defective. Refer to section 5.

4.4 Reverse Alarm Does Not Sound

If the reverse alarm does not sound, firstly check the wiring and connectors from the controller's reverse alarm output and the sounder itself, Tiller - pin 4.

4.5 Vehicle Will Not Drive in Reverse

This section is only applicable to vehicles fitted with single-ended throttle configurations. If the vehicle does not drive in reverse and the reverse switch is in the correct position, then the voltage at reverse input should be checked. Depending on whether the

controller is programmed to non-inverting or inverting throttle polarity (refer to Chapter 1 section 4.9), then on a correctly functioning system the voltage at reverse input should be as below. If the voltages are incorrect then check the wiring and connectors to the freewheel switch.

Non-inverting throttle:

Tiller - pin 2:	0V ± 0.5V to drive in reverse 5V ± 0.5V to drive forwards

Inverting throttle:

Tiller - pin 2 :	0V ± 0.5V to drive forwards 5V ± 0.5V to drive in reverse

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

4.6 Motor or Brake Becomes Very Warm

The motor will become very warm if it is being overloaded. One cause maybe that the solenoid brake is jamming. To check this, refer to the vehicle manufacturer's instructions.

4.7 Batteries Discharge Very Quickly

The batteries can discharge very quickly for several reasons, these are listed below.

- Worn or damaged batteries - check battery condition.
- Charger defective or incorrect charger being used - check charger operation type (refer to vehicle operating instructions).
- Incorrect batteries being used - refer to vehicle manufacturer's instructions for correct battery types.
- Solenoid brake jamming - see section 4.6.

The ambient temperature has a significant effect on battery capacity. Therefore, if the temperature is lower than normal the vehicle's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading.

5 Servicing of Defective Units

There are no serviceable parts within the controller. Consequently, any defective units must be returned to PGDT or a PGDT approved service organization for repair.

Opening or making any unauthorized adjustments or modifications to the controller or its components will invalidate any warranty and may result in hazards to the vehicle user, and is strictly forbidden.

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modification to the controller.

CHAPTER 5
S-DRIVE DIAGNOSTICS

1 Introduction

This chapter is to be used in relation to S-Drive controllers only. It describes the specific S-Drive trip types and their meanings, as well as giving remedy suggestions.

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair.

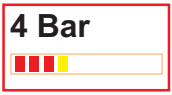
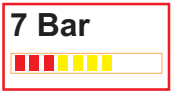
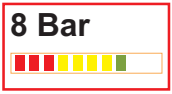
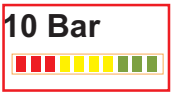
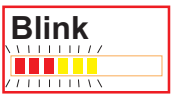
2 S-Drive Trip Table

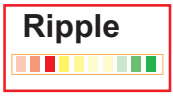
Trip Code	Trip Type	Description
0300	7	Throttle Trip. Ref to Section 3.7
0815	7	Throttle Trip. Ref to Section 3.7
0A00	Blink	Sleep Mode. Ref to section 3.11
0E07	7	Throttle Trip. Ref to Section 3.7
0E08	7	Throttle Trip. Ref to Section 3.7
1500	9	Short Circuit in Solenoid Brake Circuit. 3.9
1502	9	Open Circuit in Solenoid Brake Circuit. 3.9
1600	10	High Battery Voltage. Ref to section 3.10
1601	10	High Battery Voltage. Ref to section 3.10
1E08	Charge Step	Inhibit 1 Active. Ref to section 3.6.1
1E09	6	Inhibit 2 Active. Ref to section 3.6.2
1E0A	Charge Step	Inhibit 3 Active. Ref to section 3.6.3
2C00	1	Low Battery Voltage. Ref to section 3.1
2F01	7	Throttle Trip. Ref to section 3.7
2F01	Ripple	Throttle Displaced Indication. Ref 3.7
3B01	2	Motor Disconnected Trip. Ref to section 3.2
3D02	3	Motor Wiring Trip. Ref to section 3.3
3D03	3	Motor Wiring Trip. Ref to section 3.3
7000	4	Freewheel Mode Engaged. Ref 3.4
7001	4	Freewheel Mode Engaged. Ref 3.4
All Others	8	Possible Controller Trip

If any other trip code is experienced, please contact PG Drives Technology for further details.

3 Trip Types and Their Possible Causes

Once the trip type has been established, refer to the relevant section below for further information.

	The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, try charging the battery.
	There is a bad connection to the motor. Check all connections between the motor and the controller.
	The motor has a short circuit to a battery connection. Contact your service agent.
	The freewheel switch is activated or the manual brake disengagement mechanism is operated. Check the position of the switch or lever. Check the controller voltage. Refer to 3.4.
	Not used.
	The controller is being inhibited from driving, this may be because the battery charger is connected or the seat is not in the driving position. Check the controller voltage. Refer to 3.6.
	A throttle trip is indicated. Make sure that the throttle is in the rest position before switching on the scooter. Check the controller voltage. Refer to 3.7.
	A controller trip is indicated. Make sure that all connections are secure. Contact your service agent.
	There is a bad connection to the parking brake. Check all connections between the parking brake and the controller. Check the controller voltage. Refer to 3.9.
	An excessive voltage has been applied to the controller. This is usually caused by a poor battery connection. Check the battery connections. Check the controller voltage. Refer to 3.10.
	The controller has entered sleep mode. Switch the scooter off and on again.
	The controller is being inhibited from driving, this may be because the battery charger is connected or the seat is not in the driving position. Check the controller voltage. Refer to 3.6.



Throttle Displaced at Power-up

3.1 Trip Type 1 - Low Battery Voltage

This occurs when the controller detects that the battery voltage has fallen below 16V. Check the condition of the batteries.

If the trip is still present after the batteries and connections have been checked, then the controller may be defective. Refer to section 5.

3.2 Trip Type 2 - Motor Disconnected

This occurs when the controller detects that the motor has become disconnected. Check the motor connectors and wiring.

Some vehicles may disconnect the motor from the controller whilst in freewheel mode. If so, check the position of the parking brake disengage lever.

If the trip is still present after the above checks have been made, then the controller may be defective. Refer to section 5.

3.3 Trip Type 3 - Motor Wiring Trip

This occurs when the controller detects a trip in the wiring to the motor, in particular if a motor connection has "short-circuited" to a battery connection. Check the motor connectors and wiring.

If the trip is still present after the above checks have been made, then the controller may be defective. Refer to section 5.

3.4 Freewheel Mode Engaged

This occurs if the freewheel switch is operated whilst the vehicle is driving, or if the freewheel switch is already operated when the vehicle is switched on. Check the position of the freewheel switch.

If the freewheel switch is in the correct position, then the controller may be defective. Refer to scetion 5.

3.5 Trip Type 5 - Not Used

3.6 Trip Type 6 - Inhibit 1, 2 or 3 Active

The S-Drive Scooter Controller has 3 highly versatile inputs that can be configured to provide inhibit and speed limiting functions. These inputs are referred to as Inhibit 1, Inhibit 2 and Inhibit 3

3.6.1 Inhibit 1 Active

This occurs when the controller detects that input 1 is activated. The most common use for input 1 is for disabling the vehicle's drive when the On-board battery charger is connected. Check that the battery charger is disconnected from the line.

If the charger is disconnected from the line, then the voltage at Charger/Programmer Pin 4 should be checked. Depending on whether the controller is programmed to

active low or active high inhibit, then on a correctly functioning controller the voltage at Charger/Programmer Pin 4 should be as follows. If the voltages are incorrect then check the wiring to charger socket or other inhibit source.

Active low: Pin 4 to Battery -ve : $V_{BATT} \pm 0.5V$ or $0V \pm 0.5V$ to inhibit

$5V \pm 0.5V$ to drive

Active high: Pin 4 to Battery -ve : $V_{BATT} \pm 0.5V$ or $0V \pm 0.5V$ to drive

$5V \pm 0.5V$ to inhibit

If input 1 input is functioning correctly and the trip is still present, then the controller may be defective. Refer to section 5.

3.6.2 Inhibit 2 Active

This occurs when the controller detects that inhihit 2 is activated. The operation of Inhibit 2 will depend upon the program settings of the controller and the scooter on which it is being used.

Check all wiring and switches connected to Inhibit 2 (Tiller Connector Pin 6). If these appear to be in working order, then the controller may be defective.

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

3.6.3 Inhibit 3 Active

This occurs when the controller detects that inhibit 3 is activated. The most common use for inhibit 3 input is for disabling the vehicle's drive when the Off-board charger is connected via the tiller. Check that the battery charger is disconnected. If the charger is disconnected, then the voltage at Tiller Connector Pin 14 should be checked. Depending on whether the controller is programmed to active low or active high inhibit, then on a correctly functioning controller the voltage at Tiller Connector Pin 14 should be as below. If the voltages are incorrect then check the wiring to charger socket or other inhibit source.

Active low: Pin 14 to Battery -ve : $V_{BATT} \pm 0.5V$ or $0V \pm 0.5V$ to inhibit

$5V \pm 0.5V$ to drive

Active high: Pin 14 to Battery -ve : $V_{BATT} \pm 0.5V$ or $0V \pm 0.5V$ to drive

$5V \pm 0.5V$ to inhibit

If inhibit 3 input is functioning correctly and the trip is still present, then the controller may be defective. Refer to section 5.

3.7 Trip Type 7 - Throttle Trip

The throttle potentiometer is supplied with a varying signal from the controller. To check a Wig-wag or Unipolar type throttle potentiometer, firstly disconnect it from the controller. Measure the resistive properties of the throttle potentiometer using a meter across each end. Divide this figure by 2 to give the centre of the potentiometer. This is the center point that the throttle should be set to. A tolerance of $\pm$ 3% is permitted when setting the throttle to the center of the potentiometer.

Example:

Assuming that the throttle potentiometer has a value of 5kΩ ± 20%, then the following figures should be seen.

Potentiometer Value	5kΩ ±20%	(6000Ω (+20%)) (4000Ω (-20%))
Potentiometer Reading	5000Ω	
Potentiometer Centre Value	2500Ω	
Potentiometer Centre Band	2575Ω (+3%) 2425Ω (-3%)	

A detailed explanation of the Throttle Trip Codes follows.

Code	Type	Description
0300	7	Speed Limit Potentiometer wiper open. (This condition will not result in a trip. Instead minimum Speed will be permitted)
0815	7	Throttle Potentiometer High or Low Ref. disconnected.
0E07	7	Wiper shorted to either Ref. (Only applicable if an ISO-Test Resistor is fitted and programmed correctly)
0E08	7	Open circuit Throttle Potentiometer Wiper.
2F01	7	Throttle displaced at power-up.

If the throttle input is functioning correctly and the trip is still present, then the controller may be defective. Refer to section 5.

3.8 Trip Type 8 - Possible Controller Trip

This occurs when the controller detects a trip within itself. The controller must be assumed defective and repaired by an authorized person. Refer to section 5.

3.9 Trip Type 9 - Solenoid Brake Trip

On a correctly functioning controller, the following voltage levels should be present

Brake + to Brake-: 0V ± 0.5V, when the throttle is at rest.
Battery voltage ± 1V, when the throttle is away from rest.

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

These voltage measurements should be carried out with the vehicle's drive wheels raised above the ground. Read the vehicle manufacturer's instructions regarding the jacking up of the vehicle.

3.10 Trip Type 10 - High Battery Voltage

This occurs when the controller detects that the battery voltage has risen above 35V for a 24V controller.

If the trip is still present after the batteries and connections have been checked, then the controller may be defective. Refer to section 5.

3.11 Blink - System Asleep

To use the scooter once it has been immobilized by the Sleep Timer function, turn the scooter off and on again.

3.12 Throttle Displaced at Power-up

The throttle has been displaced prior to or whilst the controller is powering up.

- Switch the controller off.
- Ensure that the throttle is in the correct start-up position.
- Switch the controller on again.

4 Other Trip Symptoms

This section covers trips which are not displayed on the status indicator by the controller. This may be because: either the controller cannot switch on; the trip is not considered critical enough to trip the controller; or the controller cannot detect the condition. None of these types of trips would present a hazard to the vehicle user.

4.1 System Will Not Switch On

With the on/off switch and keyswitch (if fitted) in the on position, check the voltage of the controller connections.

For controller to operate, the voltage at the specified pin should be equal to battery positive ± 0.25V. If this voltage is present and the vehicle will not switch on, then the controller may be defective. Refer to section 5.

4.2 Vehicle Drives Slowly

If you think the controller has been programmed differently from the manufacturer's presets, check the programmed values. If these appear to be correct, then carry out the following checks.

Firstly, check that the solenoid brake is not jammed. Refer to the vehicle manufacturer's instructions to see how to do this.

Secondly, check the voltage at the controller's slow/fast input. On a correctly functioning system the voltage should be as below. If the voltages are incorrect then check the wiring and connectors to the slow/fast switch.

Tiller - pin 9:	0V ± 0.5V for slow mode
	5V ± 0.5V for fast mode

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

4.3 Status Indicator Does Not Light

If the vehicle appears to be operating correctly but the status indicator does not light, then check the wiring and connectors from the controller's status indicator output to the status indicator itself.

On a correctly functioning system with a fully charged battery, the voltage on status indicator output should be;

Highside	Pin 10 to BATT-ve 12V ± 1V
Lowside	BATT-ve to pin 10 24V ± 1V

If this voltage is not present even when there is no connection to the controller, then the controller may be defective. Refer to section 5.

4.4 Reverse Alarm Does Not Sound

If the reverse alarm does not sound, firstly check the wiring and connectors from the controller's reverse alarm output and the sounder itself, Tiller - pin 3.

4.5 Vehicle Will Not Drive in Reverse

This section is only applicable to vehicles fitted with single-ended throttle configurations. If the vehicle does not drive in reverse and the reverse switch is in the correct position, then the voltage at reverse input should be checked. Depending on whether the controller is programmed to non-inverting or inverting throttle polarity (refer to Chapter 1 section 4.9), then on a correctly functioning system the voltage at reverse input should be as below. If the voltages are incorrect then check the wiring and connectors to the freewheel switch.

Non-inverting throttle:

Tiller - pin 9:	0V ± 0.5V to drive in reverse
	5V ± 0.5V to drive forwards

Inverting throttle:

Tiller - pin 9 :	0V ± 0.5V to drive forwards
	5V ± 0.5V to drive in reverse

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 5.

4.6 Motor or Brake Becomes Very Warm

The motor will become very warm if it is being overloaded. One cause maybe that the solenoid brake is jamming. To check this, refer to the vehicle manufacturer's instructions.

4.7 Batteries Discharge Very Quickly

The batteries can discharge very quickly for several reasons, these are listed below.

- Worn or damaged batteries - check battery condition.
- Charger defective or incorrect charger being used - check charger operation type (refer to vehicle operating instructions).
- Incorrect batteries being used - refer to vehicle manufacturer's instructions for correct battery types.
- Solenoid brake jamming - see section 4.6.

The ambient temperature has a significant effect on battery capacity. Therefore, if the temperature is lower than normal the vehicle's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading.

5 Servicing of Defective Units

There are no serviceable parts within the controller. Consequently, any defective units must be returned to PGDT or a PGDT approved service organization for repair.

Opening or making any unauthorized adjustments or modifications to the controller or its components will invalidate any warranty and may result in hazards to the vehicle user, and is strictly forbidden.

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modification to the controller.

CHAPTER 6
WARNING SUMMARY

1 Introduction

This section summarizes all of the very important warnings that appear throughout the text of this manual. Do operate the programmer without reading, understanding and observing the following warnings. Failure to observe these warnings could result in UNSAFE CONDITIONS for the user of a scooter or affect the reliability of the controller. PG Drives Technology accepts no liability for losses of any kind arising from failure to comply with any of the conditions in the warnings listed below.

2 Warnings

2.1 Introduction

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values. Chapter 1 Section 1.

2.2 Using The SPIa

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values. Chapter 1 Section 3.

2.3 Using The SPIa - Diagnostics

When the SPIa is connected to a PGDT programmable controller, the electromagnetic compatibility (E.M.C.) performance of the vehicle may be affected. Disconnect the SPIa as soon as programming is complete and do not use the SPIa in environments which are E.M.C. sensitive. Chapter 1 Section 3.1.2.

2.4 Forward Accel'n

Setting this value too high could cause the scooter to tip when accelerating up a slope. Chapter 1 Sections 4.1.

2.5 Forward Decel'n

It is the responsibility of the scooter manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184. Chapter 1 Sections 4.2.

2.6 Reverse Decel'n

It is the responsibility of the scooter manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184.

Setting this value too high could cause the scooter to tip when stopping whilst reversing down a slope up a slope. Chapter 1 Sections 4.4.

2.7 Max Forward Speed

Ensure the stability of the scooter is maintained, especially when cornering, at the programmed Max Forward Speed. Chapter 1 Sections 4.5.

2.8 Introduction

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair. Chapter 2 Sections 1.

2.9 Introduction

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair. Chapter 3 Sections 1.

2.10 Batteries Discharge Very Quickly

The ambient temperature has a significant effect on battery capacity. Therefore, if the temperature is lower than normal the vehicle's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading. Chapter 3 Sections 4.7.

2.11 Servicing of Defective Units

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modification to the controller. Chapter 3 Sections 5.

2.12 Introduction

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair. Chapter 4 Sections 1.

2.13 Batteries Discharge Very Quickly

The ambient temperature has a significant effect on battery capacity. Therefore, if the temperature is lower than normal the vehicle's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading. Chapter 4 Sections 4.7.

2.14 Servicing of Defective Units

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modification to the controller. Chapter 4 Sections 5.

2.15 Introduction

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair. Chapter 5 Sections 1.

2.16 Batteries Discharge Very Quickly

The ambient temperature has a significant effect on battery capacity. Therefore, if the temperature is lower than normal the vehicle's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading. Chapter 5 Sections 4.7.

2.17 Servicing of Defective Units

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modification to the controller. Chapter 5 Sections 5.