MX5000
MX2500
MX1600
XRI

PRODUCT SUPPORT MANUAL

July, 1997

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GALLAGHER SMARTPOWER ENERGIZERS

A revolution in time saving problem prevention... profit improvement

Today's high performance farming demands manufacturers provide products and systems that are forever more capable and reliable, yet at the same time simpler to use. To meet the needs of today's leading farmer Gallagher bring you the SmartPower Energizer - the most technically advanced Power Fence Energizer in the world. The use of "leading edge" technology gives this revolutionary Energizer the capability to not only improve animal control but to ensure your fence system is more convenient and efficient to manage.

What a SmartPower Energizer offers you

- The convenience of being able to turn the fence ON or OFF from anywhere the fence is powered **(Remote Control)**
- Maximum Output Voltage, especially under heavy fence loads **(Adaptive Control)**
- The ability to know how hard the Energizer is working **(Stored Energy)**
- Simple and efficient fence maintenance **(Stored Energy & Fence Voltage)**
- Secure animal control **(Output Voltage & Earth Alarm)**

EQUIPMENT

Your SmartPower package includes
- SmartPower Energizer MX1600, MX2500 or MX5000
- SmartPower XR1 Remote Control with pouch
- SmartPower Operators Manual
- "Help Guide" Wall Chart and "Demonstration Video"
- Gallagher Power Fence Manual
- Privileged membership to the "Gallagher Users Group"

SmartPower MX1600 has 16 Joules of Stored Energy (@ 220-240V) and will power up to 65 km (42 miles) of multi-wire fence.

SmartPower MX2500 has 24 Joules of Stored Energy (@ 220-240V) and will power up to 80 km (50 miles) of multi-wire fence.

SmartPower MX5000 has up to 41J (@ 220V), 45J (@ 230V), 48J (@ 240V) of Stored Energy and will power up to 120 km (75 miles) of multi-wire fence.

Note: Distances are a guide only. In dry conditions Energizers have proven to work efficiently for more than twice the distance. In high vegetation growth areas, distances may need to be reduced to less than half.

Use Gallagher PowerFence™ Accessories to gain maximum performance from your SmartPower Energizer.

For power cord replacement or module changes, contact your Dealer.

INSTALLATION INSTRUCTIONS

Install your Smartfence Energizer in a convenient, frequently accessed place. The display and alarms give valuable information that can save time and help prevent costly problems. Mount the Energizer on a wall, under cover, adjacent to a mains power connection, safe from children and mechanical damage and if possible aaway from heavy electrical equipment (e.g. pumps).

1. Using the template on the "Important Information" sheet, drill 2 x 4mm holes and attach the top of the Energizer to the wall
2. Install the third screw in the central bottom hole.
3. **Fence:** Connect the fence live wire to the RED OUTPUT (⚡) Terminal. Use Gallagher Lead Out Cable (G627X) and Joint Clamps (G603) to bring the live wire into the building.
4. **Earth:** Connect the Earth System to the GREEN EARTH (⏚) Terminal. Use Gallagher Lead Out Cable (G627X) and Earth Clamps (G626) to make a high quality connection between the earth stakes or earth return wire and Energizer.
5. Plug in the Energizer and switch ON. Allow at least 30 pulses for the Energizer to adapt to the fence system.

From this point on your Smartfence Energizer is very different from conventional Energizers. The first thing to note is that the electronic display will begin cycling through 4 different readings:

1. Stored Energy (**J** symbol)
2. Output Voltage (⚡ lightning bolt symbol)
3. Fence Voltage (no symbol)
4. Fence Voltage (⏚ earth symbol)

Note 1: Each reading gives you important information about the performance of your fence system (the red back light illuminates the electronic display for easy reading in dark conditions)..

Note 2: Readings will change as your SmartPower Energizer responds to fence conditions (this is the Energizer monitoring the fence and adapting its power output accordingly).

Note 3: If the Earth Alarm sounds, ignore it until the Earth Test is complete.

Earth Test: It is very important to have a high quality Earth System. For an all live wire fence system save time by installing at least 9 Earth Stakes before you start.

6. Turn the Energizer OFF: At least 40 metres along the fence drive a steel stake into the soil (enough to reach moist soil), connect it to the live wire.
7. Turn the Energizer ON and check the Stored Energy reading. Add steel stakes until Stored Energy reads at least 35 Joules for the MX5000, 17 Joules for the MX2500 or 14 joules for the MX1600 (if the Output Alarm (OA) sounds remove a steel stake).
8. Add Earth Stakes (G619) until you achieve 200-300 or less volts on the Earth reading – for explanation refer to the section on “What does Earth Voltage tell you?”. **Construct the Earth System as directed in the Gallagher Power Fence Manual.**
9. Turn the Energizer OFF. Remove the steel stakes from the fence.

Note 4: If the Earth alarm sounds when you remove the steel stakes contact your Gallagher Dealer or National Distributor to change the alarm settings.

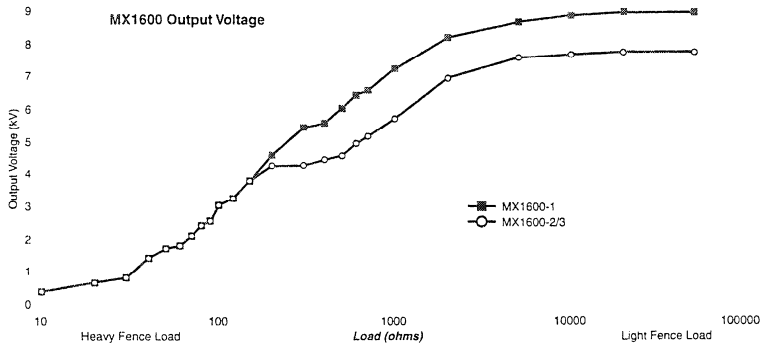
10. **Fence Return**: Remove the link and connect the return wire to the BLUE (⚡) Terminal – for explanation refer to the section on "What does Fence Voltage tell you?" If you DO NOT wish to use this feature, link the BLUE (⚡) Terminal to the RED OUTPUT (⚡) Terminal with the connector attached to the RED Terminal. Failure to make this link will cause the Fence Alarm (FA) to sound.

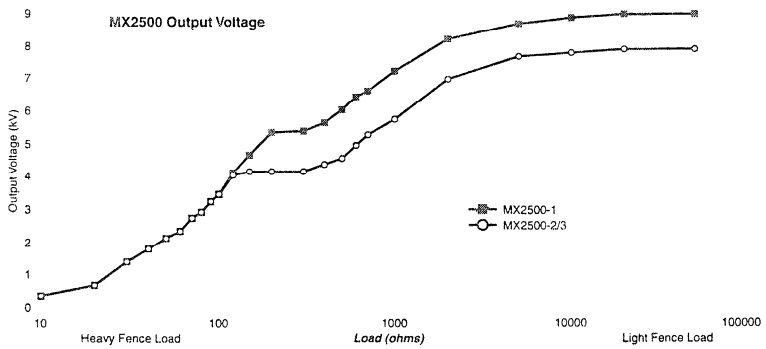
Note 5: **Read this Manual and the SmartPower Trouble Shooting Guide (at the back of the Manual) for a complete understanding of the displays and alarms.**

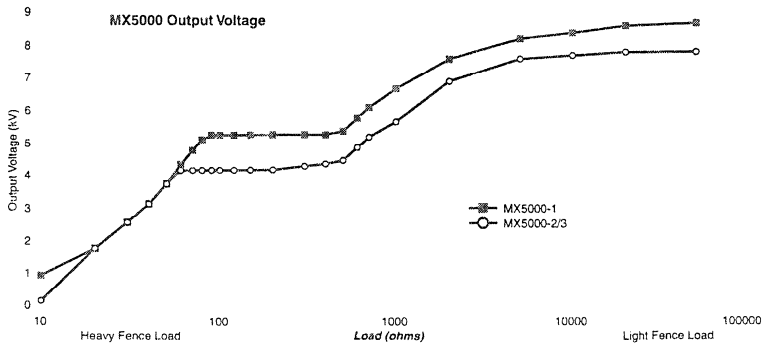
UNDERSTANDING YOUR SMARTFENCE ENERGIZER

What is Adaptive Control?

Your SmartPower Energizer operates with Adaptive Control. Adaptive Control is a patented technology which increases Stored Energy as the fence load increases (maybe due to grass growing on to the fence). A minimum 5.4kV Output Voltage in New Zealand, Australia, South Africa (4.2kV in Europe due to different Electrical Standards) is maintained, until the Energizer is overloaded. This ensures maximum shock is always delivered, maintaining effective animal control



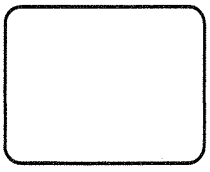




What does Stored Energy tell you?

Stored Energy is displayed every fourth cycle - identified by the "**J**" symbol. Stored Energy is the amount of energy (Joules) available - the actual output depends on the fence load and the efficiency of the Energizer. When your fence is in good condition the Energizer only uses a small volume of energy per pulse - minimum Stored Energy is 13 Joules in New Zealand, Australia and South Africa - 7 Joules in Europe. As your fence becomes more heavily loaded Adaptive Control delivers more energy in each pulse - e.g. MX5000 up to 48 Joules. Figure 1 illustrates the Stored Energy reading.

Stored Energy Measurement



Waiting for the next Pulse

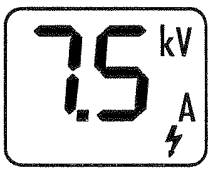
FIGURE 1: Stored Energy Measurement

Stored Energy is therefore a measure of fence condition. If the MX5000 increases to 40 Joules or greater (equally the MX2500 increases to 20 Joules or greater or the MX1600 increases to 14 Joules or greater) then the fence is in poor condition and close to overloading your Energizer's capacity. Fence maintenance is required.

If additional fence is connected, the level of Stored Energy will indicate the Energizer is able to cope with the extra load or you need to upgrade to a larger Energiser**.**

What does Output Voltage tell you?

Output voltage is the second reading - identified by the **lightning bolt** symbol (). Output Voltage is voltage leaving your Energizer. Under heavy fence load Output Voltage will normally be higher than the Fence Voltage. Figure 2 illustrates the Output Voltage reading, in kilovolts (kv).



Output Voltage Measurement

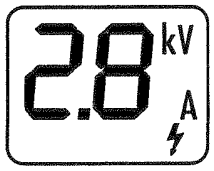
Waiting for the next Pulse

FIGURE 2: Output Voltage Measurement

Your SmartPowere Energizer features a low Output voltage Alarm (OA). If Output voltage drops below 3kV (factory default setting) and the Energizeris unable to re-establish 3kV, even at maximum Stored Energy, then the Output Alarm is activated. The Output Alarm can be either turned OFF, or set at 2kV, 3kV or 4kv - consult your Gallagher Dealer or National Distributor if you wish to change the default setting. The symbol 'A' is displayed (Figure 2) when the Output Alarm is set.

XXXXXXXX When the Output Alarm is activated the alarm sounds for 5 minutes. Simultaneously the display will flash between "OA" and Output voltage (Figure 3) until the fence condition is corrected and Output Voltage returns above the minimum setting. **An Output Voltage of 2.8kV is at risk of being inadequate for effective stock control. Fence maintenance is required. Always aim to maintain voltage well above the Output Alarm default setting.**

Output Alarm

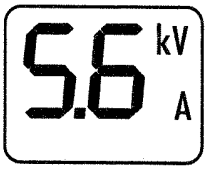


Output Voltage Measurement

FIGURE 3: Output Alarm Indication

What does Fence Voltage tell you?

A special feature of your Smartfence Energizer is its ability to monitor a specific section of fence. This offers the advantage that, whilst Output Voltage may be adequate, voltage out on the fence (particularly in the case of large networks or areas with heavy vegetation) can be significantly below the Output voltage. Monitoring voltage on a critical part of the fence ensures effective stock control is maintained. Fence Voltage is displayed every second cycle - identified by **no symbols** on the display. To monitor Fence Voltage a wire is returned to the Energiser from the section of fence you wish monitored (e.g. the furthermost point of your property) and connected to the BLUE (ϟ) terminal. Figure 4 illustrates the Fence Voltage reading.



Fence Voltage Measurement

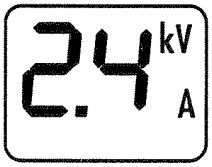
Waiting for the Next Pulse

FIGURE 4: Fence Voltage Reading

Your Smartfence Energizer also features a Fence Voltage Alarm (EA). lf Fence Voltage drops below 3kV (factory default setting) and the Energizer, even at maximum Stored Energy, is unable to reestablish 3kV then the Fence Alarm is activated. The Fence Alarm can be either turned OFF, set on security mode (refer "Security Option"), or set at 3kV or 4kV - consult your Gallagher Dealer or National Distributor if you wish to change the default setting. The symbol '**A**' is displayed (Figure 4) when the Fence Alarm is set.

When the Fence Alarm is activated the alarm sounds for 5 minutes. Simultaneously the display will flash between "**FA**" and Fence Voltage (Figure 5) until the fence condition is corrected and Fence Voltage returns above the minimum setting. **A Fence Voltage of 2.4kV is at high risk of being inadequate for effective stock control. Fence maintenance is required**

Fence Alarm



Fence Voltage Measurement

FIGURE 5: Fence Alarm Indication

Note: If you DO NOT wish to monitor Fence Voltage, link the BLUE (⚡) Terminal to the RED OUTPUT (⚡) Terminal with the connector attached to the RED Terminal.

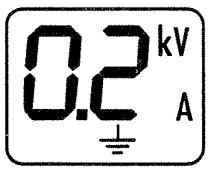
Security Option

Fence Voltage can either monitor minimum fence voltage (as described above) or a sudden, sustained drop in fence voltage - the Security Option. This option is available for simple security measures, e.g. around a building or valuable piece of machinery Under the security Option the "**FA**" alarm will activate if Fence Voltage drops below 2.0kV for 3 or mom consecutive pulses. For example, if a fence is dropped on the ground, a vehicle driven over it and the fence returned to its previous state, the security feature will alarm, alerting you of the breach. Alarms and displays are as described in the "Fence Voltage" section above, except that the display will continue to alert you of the breach. You can return the display to normal operation by, firstly, correcting the cause (e.g. standing the fence up again) and then turning the Energiser OFF and ON again at the mains. Consult your Gallagher Dealer or National Distributor if you wish to change the default setting to the "Security Option".

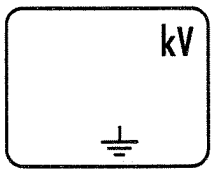
Note: **This Smarfence Energiser offers the ability to monitor only a single fence system. If you wish to install a comprehensive security system then consult Gallagher Security or your National Distributor.**

What does Earth Voltage tell you?

Earth Voltage is displayed every third cycle - identified by the **earth symbol** (⏚). .Figure 6 illustrates the Earth Voltage reading in kilovolts (kV).



Earth Voltage Measurement



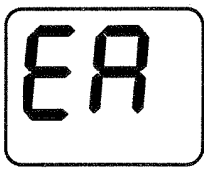
Waiting for Next Pulse

FIGURE 6: Earth Voltage Reading

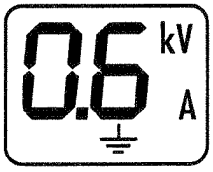
Your Smartfence Energizer features an Earth voltage Alarm (EA). This is an audible alarm which is activated when Earth Voltage goes above 500 volts (factory default setting). The Earth Alarm can be either turned OFF, or set at 300, 500 or 700 volts - consult your Gallagher Dealer or National Distributor if you wish to change the default setting. The symbol 'A' is displayed (Figure 6) when the Earth Alarm is set.

Earth Voltage indicates the quality of your Earth (refer Gallagher Power Fence™ Manual for "Earthing System" instructions). Smartfence makes installation of your earth very simple. For example, an earth reading of 0.6kV (as per Figure 7) would activate the Earth Alarm - being greater than the default setting of 0.5kV. In the case of an "All Live Wire System" just keep adding earth stakes until you get a reading of ideally around 0.2kV. In particularly dry climates, 0.2kV may be difficult to achieve.

When the Earth Alarm is activated the alarm sounds for 5 minutes. Simultaneously the display will flash between "EA" and Earth Voltage (Figure 7) until the quality of Earth is improved.



Earth Alarm



Earth Voltage Measurement

FIGURE 7: Earth Alarm Indication

Note: **The Earth Alarm indicates that the quality of the earth needs to be improved for optimum fence and "Remote" performances. Ideally the Earth reading is as low as practical.**

YOUR SMARTFENCE REMOTE

Your Smartfence XRI Remote is a hand held device which switches the Energizer ON on OFF from anywhere on the fence.

How to Use Your Remote

1. Either push the earth stake into the ground (All Live Fence System) or place the earth stake on the earth wire (Fence Wire Return System).
2. Place the brass terminal on the live fence wire.
3. The Remote wilt indicate Energizer pulses (Normal Operation) by regular, short flashes (0.3 of a second) of the LED.
4. Push the button to switch the Energizer ON or OFF.

Your Remote LED gives a long flash (0.8 of a second) to indicate the signal has been transmitted. Your Energizer will switch between Normal Operation (ON) and Standby Mode (OFF). Repeat the process and your Energizer will switch between Standby Mode and Normal Operation.

Attention: Damage can be caused you reverse the connection. DO NOT place the earth stake on the live fence wire and the brass terminal on the earth. Damage can be caused if you use the Remote on a fence not powered by a Smartfence Energiser. ONLY USE THE REMOTE WITH A SMARHENCE ENERGIZER.

Low Battery

The LED gives 5 quick successive flashes, either when the button is pushed or the Remote receives a fence pulse, then the Remote battery is flat. It is possible that the Remote signal will be detected by the Energizer but we advise you replace the 9 volt battery as soon as possible.

Energizer Standby Mode

Your Smartfence Energizer indicates it is going into or out of Standby Mode by the alarm sounding 5 times. Whilst in the Standby Mode the alarm sounds every 8 seconds and the display flashes between the two displays shown in Figure 8.

FIGURE 3: Standby Mode Indication

Remote Performance

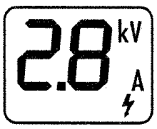
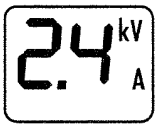
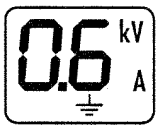
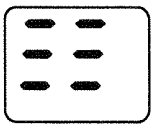
A poor Earth will adversely affect the ability of the Energiser to receive clear signals from the Remote. Both your Energizer and Remote are preset with an identifying code. ln the rare event that your neighbour has a Remote with the same identifying code - hence your neighbour can unintentionally turn your Energizer Off and On - your Gallagher Dealer or National Distributor are able to re-program an alternative code in both the Energiser and Remote.

On rare occasions electrical interference (on the fence) can mask the Remote signal. To safeguard against undesired/confusing signals (which could potentially turn your Energiser ON or OFF) your Smartfence Energizer monitors electrical interference and will ignore signals on the fence at times of high interference. When not reading signals the Electrical Interference Alarm sounds on alternate displays as the Energizer cycles through the normal readings.

Note: **In the very unlikely event that electrical interference exactly reproduces the Remote signal, and unwanted switching occurs, contact your Gallagher Dealer or National Distributor.**

SMARTFENCE TROUBLE SHOOTING GUIDE

Your Smartfence Energizer not only has the capability to inform yoou of what is happening on the fence but also the ability to diagnose its own troubles. Below is a summary of what the alarms and display mean.

DISPLAY	CAUSES	SOLUTION
  **Output Alarm**	Heavily Loaded Fence	Check for shorts on fence. Remove excess vegetation from fence.
  **Fence Alarm**	Heavily Loaded Fence. Fence loop cut.	Check for shorts on fence. Remove excess vegetation from fence. Check fence circuit for continuity.
  **Earth Alarm**	Insufficient Earth System	Improve Earth System
(NORMAL OPERATION) **Electrical Interference Alarm**	Electrical interference preventing Energizer from receiving clear Remote signal.	Self-correcting.
  **Energizer Standby**	Remote has switched Energizer toi Standby mode.	Use Remote to switch Energizer ON again.
  **Energizer Error**	Errors E1 to E14 in Energizer.	Record the error number and contact your Gallagher Dealer
  **Abnormal Operation**	Energizer readjusting.	Self Correcting If not cleared after 3 minutes contact your Gallagher Dealer.
  **Installation Error**	Energizer installed incorrectly	Check Output and Earth Terminals are correctly connected.

If the above remedies do not cure the problem contact your Gallagher Dealer or National Distributor.

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Chapter 2

SMARTFENCE SWITCH CONFIGURATIONS

The Smartfence Energizer is manufactured with setting options for, Earth Voltage, Fence Voltage, Output Voltage and the Remote Control, identifying code. To change settings locate the blue switch panel on the Control Board just below the LCD.

The factory set default positions are shown below. This default configuration has the Output Voltage Alarm set at 3 kV, Fence Voltage Alarm set at 3 kV, and the Earth Voltage Alarm set at 500 V.

WARNING : EXTREME CAUTION
Remember to always disconnect the power supply to the Energizer before removing the cover. Exposed mains connections can result in a lethal electric shock.

Header Pin label	Option	Default position	Default configuration
SW1	The Earth Voltage Alarm	⊡ ▪ ON	500V
SW2	The Earth Voltage Alarm	▪ ⊡	500V
SW3	Fence Voltage Alarm	⊡ ▪	3 kV
SW4	Fence Voltage Alarm	▪ ⊡	3 kV
SW5	Remote Control Code	▪ ⊡	PRESET
SW6	Remote Control Code	▪ ⊡	PRESET
SW7	Output Voltage Alarm	⊡ ▪	3 kV
SW8	Output Voltage Alarm	▪ ⊡	3 kV

The **Earth Voltage Alarm** is set by switches 1 and 2.

Header Pin Label		**Alarm Setting**
SW1	▪ ⊡ ON	Earth Voltage Alarm
SW2	▪ ⊡	DISABLED
SW1	▪ ⊡ ON	Earth Voltage Alarm
SW2	⊡ ▪	>700 V
SW1	⊡ ▪ ON	Earth Voltage Alarm
SW2	▪ ⊡	>500 V (default)

SW1	⊡ ▪	ON	Earth Voltage Alarm
SW2	⊡ ▪		>300 V (default)

The **Fence Voltage Alarm** is set by switches 3 and 4.

Header Pin Label			**Alarm Setting**
SW3	▪ ⊡	ON	Fence Voltage Alarm
SW4	▪ ⊡		DISABLED
SW3	▪ ⊡	ON	Fence Voltage Alarm
SW4	⊡ ▪		< 4 kV
SW3	⊡ ▪	ON	Fence Voltage Alarm
SW4	▪ ⊡		< 3 kV (default)
SW3	⊡ ▪	ON	Fence Voltage Alarm
SW4	⊡ ▪		< 2 kV (security mode)

Note: When the Security Alarm is enabled, the alarm will activate after 3 pulses (under 2 kV) and time out after 5 minutes. For 3 kV and 4 kV, the alarm will activate after 30 pulses. This allows the unit to adapt up.

The **Output Voltage Alarm** is set by switches 7 and 8.

Header Pin Label			**Alarm Setting**
SW7	▪ ⊡	ON	Output Voltage Alarm
SW8	▪ ⊡		DISABLED
SW7	▪ ⊡	ON	Output Voltage Alarm
SW8	⊡ ▪		< 4 kV
SW7	⊡ ▪	ON	Output Voltage Alarm
SW8	▪ ⊡		< 3 kV (default)
SW7	⊡ ▪	ON	Output Voltage Alarm
SW8	⊡ ▪		< 2 kV

Note: The Output Alarm will activate only after the unit has tried to adapt up.

Chapter 3
Remote Control Codes

The Remote Control transmits a Pulse Position Modulated High Voltage Signal onto the electric fence. When this signal is received by the energized, the Energizer switches between Normal Operation and Standby Mode. Currently all Remote Controls transmit the same signal, so all Remote Controls will operate all Smartfence Energizers.

However, when two or more Smartfence Energizers are operating in close proximity it may be necessary to adjust the signal used by either Smartfence System. This is because the high voltage pulses used on one Smartfence System can become induced on the second Smartfence System. This could result in a Remote Control switching the neighbouring Smartfence Energizer ON or OFF.

To prevent this occurring the Smartfence System can be set to any one of four different signals. To change the signal used you must adjust DIP switches in both the Remote Control and the Energizer. All Smartfence energizes and Remotes are delivered with "Signal 1" as the default.

WARNING : EXTREME CAUTION
Remember to always disconnect the power supply to the Energizer before removing the cover. Exposed mains connections can result in a lethal electric shock.

To change the signal, select one of the other signals and set both the Remote Control and the Energizer Switches to corresponding settings. Energizer Switches are located on the control board (2A0288, 2A0304) just below the LCD.

Energizer DIP Switch		**Remote ID Setting**
SW5	▪ ⊡ ON	Signal 1 (default)
SW6	▪ ⊡	
SW5	▪ ⊡ ON	Signal 2
SW6	⊡ ▪	
SW5	⊡ ▪ ON	Signal 3
SW6	▪ ⊡	
SW5	⊡ ▪ ON	Signal 4
SW6	⊡ ▪	

The Remote Control Switches are located on the Remote control board (2A0287) to the left of the 16 pin IC.

Remote Control DIP Switch		**Remote Identity Setting**
SW1	▪ ⊡ ON	Signal 1 (default)
SW2	▪ ⊡	
SW1	⊡ ▪ ON	Signal 2
SW2	▪ ⊡	
SW1	▪ ⊡ ON	Signal 3
SW2	⊡ ▪	
SW1	⊡ ▪ ON	Signal 4
SW2	⊡ ▪	

Remote Control Limitations
The Remote Control is a negative pulse polarity device. Contacting the terminals incorrectly will result in a positive pulse, damaging the Remote Control circuitry.
Therefore:

- **Do not** place the earth stake on the live fence wire and the brass terminal on the earth.
- **Do not** use the Remote Control on a fence not powered y a Smartfence Energizer.

A poor earth will adversely affect the ability of the Energizer to receive clear signals from the Remote. For trouble free operation ensure the earth voltage, as displayed on the Energizer, is as low as possible. With a ground return earth system the Remote Control operation will degrade if soil conditions become very dry. If operation of the Remote Control is unreliable in these conditions, endeavour to find the wettest possible soil; conditions (i.e. under vegetation or near a water trough) to operate the Remote Control.

Operating the Remote Control near a heavy load on a fence or on a poor fence system can limit the ability of the Remote signal from reaching the Energizer. The reality of the design concept is that Smartfence requires a high quality fence system for effective operation. The user must recognise this as a basic requirement if he wishes to benefit from the Smartfence features.

On rare occasions electrical interference (on the fence) can mask the Remote Control signal. To safeguard against undesired/confusing signals (which could potentially turn the Energizer ON or OFF your Smartfence Energizer monitors the electrical interference and will ignore signals on the fence at times of high interference. When not receiving signals the Electrical Interference Alarm sounds on alternate displays as the Energizer cycles through the normal readings.

NOTE In the very unlikely event that electrical interference exactly reproduce the Remote signal, and unwanted switching occurs, pass the information back to Gallagher Research & Development.

Chapter 4

Smartfence Energizers and the Fence Impulse Analyser

Testing a Smartfence Energizer with a Fence Impulse Analyser (FIA) is not recommended as readings obtained can be misleading. This is due to the Adaptive Control technique used by these Energizers.

The FIA analyses the fence impulses generated by the Energizer. For correct meaningful results the FIA requires 13 constant, consecutive pulses. Adaptive Control adjusts the output pulse to maximise voltage on the electric fence. If the FIA is measuring the pulses whilst the Energizer is adapting the readings will be invalid. For these reasons we do not recommend the use of an FIA to test Smartfence Energizers.

If you do wish to use an FIA to test a Smartfence Energizer contact Gallagher Research & Development

Chapter 5

Points to Remember

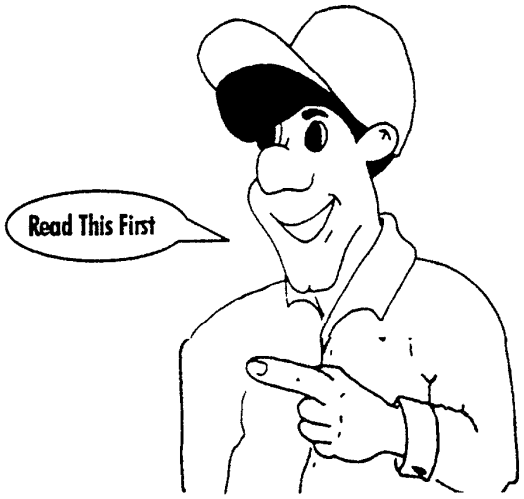
See Important Information Leafleat attached.

INSTALLATION TEMPLATE
DRILL HOLES HERE

IMPORTANT INFORMATION

- For your convenience we have preset the alarm levels at:
  Output Alarm 3kV
  FenceAlarm 3kV
  Earth Alarm 500V
- The Earth Alarm will sound if this Energizer is operated with an inadequate Earth System.
- This is a high performance Energizer. In order to obtain optimum performance you may need to improve your Earth System.
- Please note:-Your Smartfence™ XR1 Remote is a sophisticated communication device. Damage can result if you:
  - Reverse the connection, i.e. place the earth stake on the live fence wire and the brass terminal on the earth.
  - Use your Remote on a fence not powered by a Smartfence™ Energizer.
- The Operators Manual contains full Installation Instructions and explanation of Displays and Alarms.

GALLAGHER SMARTfence



INSTALLATIE MAL
BOOR HIER DE GATEN

BELANGRIJKE INFORMATIE

- De diverse alarmniveau's zijn standaard als volgt ingesteld:
  Uitgaande spanning 3kV
  Retourspanning 3kV
  Aardespanning 500V
- Het aardealarm gaat af wanneer het apparaat met onvoldoende aarding in werking wordt gesteld.
- Dit is een hoog vermogens schrikdraadapparaat. Om een optimale prestatie te kunnen verrichten, zal het mogelijk zijn dat de aarding verbeterd moet worden.
- Let op: Uw Smartfence XR1 afstandsbediening is een hoogwaardig communicatiemiddel. Beschadiging kan ontstaan door:
  - de aansluitingen omgekeerd te gebruiken, d.w.z. de aardepen op het raster en de rasteraansluiting op de aarde.
  - het gebruik van de afstandsbediening op een raster dat niet door een Smartfence schrikdraadapparaat gevoed wordt.
- De handleiding bevat uitgebreide informatie over de installatie, het gebruik en de verklaringen van de gebruikte symbolen in de display.

GALLAGHER SMARTfence

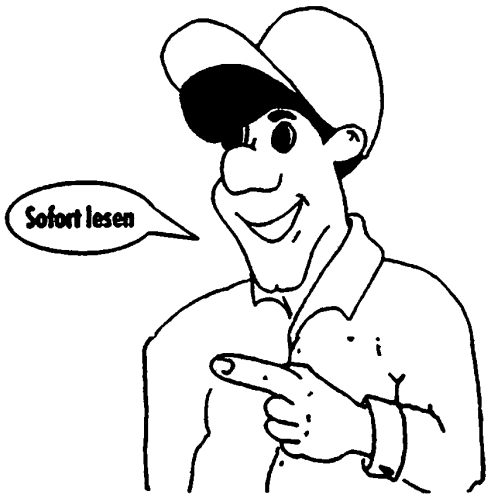
MONTAGE-SCHABLONE

BOHREN SIE HIER 2 LOCHER

WICHTIG WICHTIG

- Zu Ihrer Erleichterung haben wir folgende Alarmgrenzen bereits voreingestellt:
  Ausgangsalarm: 3 kV
  Zaunalarm: 3 kV
  Erdungsalarm: 500 V
- Der Erdungsalarm ertönt, wenn dieses Elektrozaungerät mit einem unzureichenden Erdungssystem betrieben wird.
- Dies ist ein Hochleistungs-Elektrozaungerät. Um damit optimale Leistung zu erhalten kann es möglich sein, daß Sie Ihr Erdungssystem verbessern müssen.
- Hinweis: Ihre Smartfence XR1 Fernbedienung ist ein technisch hochentwickeltes Kommunikations-Instrument. Die Fernbedienung kann beschädigt werden:
  - Wenn Sie die Anschlüsse vertauschen, d.h. den Erdstab an den Zaun halten und die Anschlußklemme in den Boden drücken.
  - Wenn Sie Ihre Fernbedienung an anderen Zäunen benutzen, die nicht an ein Smartfence Elektrozaungerät angeschlossen sind.
- Beigefügte Bedienungsanleitung enthält umfangreiche Installationshinweise und Erklärungen zu den Digitalanzeigen und Alarmfunktionen.

GALLAGHER SMARTfence



GABARIT D'INSTALLATION

PERCER LES TROUS ICI

NOTICE IMPORTANTE

- Pour plus de commodité les alarmes sont préréglées comme suit:
  Alarme sortie: 3 kv
  Alarme clôture: 3 kv
  Alarme terre: 500 V
- L'alarme de terre sonore se déclenchera si cet électrificateur est mis sous tension avec un système de mise à la terre insuffisante.
- Cet électrificateur est très performant. Pour obtenir les meilleurs résultats, il sera peut-être nécessaire d'améliorer votre système de mise à la terre.
- À noter, s.v.p. - Votre télécommande Smartfence™ XRI est un dispositif de communication sophistiqué. Elle risque d'être endommagée si:
  - La polarité des connexions est inversée, c.-á.d. si la tige de terre est appuyée contre le fil de clôture électrifié et si la borne de laiton entre en contact avec la mise à la terre.
  - La télécommande est utilisée avec une clôture qui n'est pas électrifiée par un électrificateur Smartfence™.
- Le manuel d'utilisation contient une notice d'installation complète avec la description détaillée des affichages et alarmes.

GALLAGHER SMARTfence

3C2533-3/94

Chapter 6

Adaptive Control and Safety

Adaptive Control adjusts the amount of energy used for each pulse to sustain voltage on the fence under heavy load conditions. The Energizer monitors the output terminal voltage and once this voltage drops below 4.2 kv the Energizer uses more energy per pulse to re-establish 4.2 kv (maximum stored energy is 24 J for the MX2500 and 48 J for the MX5000). When voltage reaches 5.0 kv the Energizer reduced energy back to the standard 7 J. The performance graphs for the MX2500 and the MX5000 are attached.

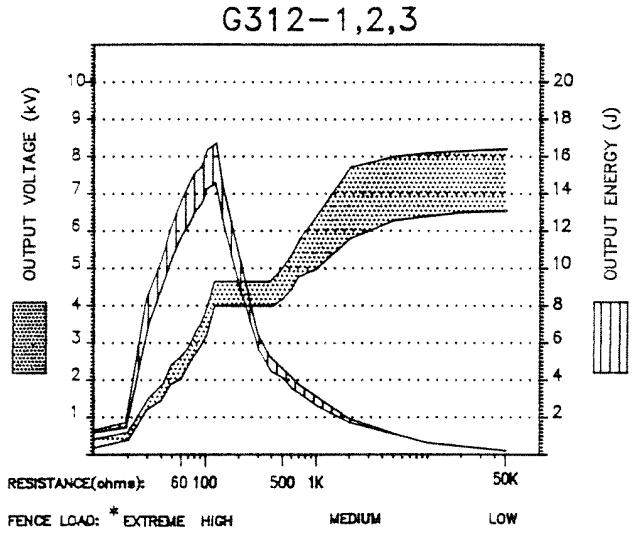
When there is a dead short and sufficient voltage (1.5 kV) cannot be re-established the Energizer reduces energy to 7 Joules. When the short is removed the Energizer will readjust to the load conditions.

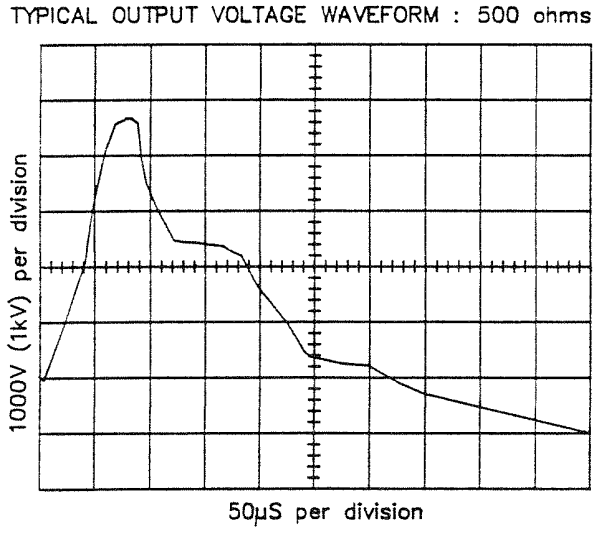
WARNING : EXTREME CAUTION
Remember to always disconnect the power supply to the Energizer before removing the cover. Exposed mains connections can result in a lethal electric shock.

For factory calibration purposes the Adaptive Control feature can be switched off. This is done by placing a link over the two header pins on the Control Board (2A0288, 2A0304). This ensures that the Energizer will store a constant 7 Joules of energy for every pulse independent of the load conditions. When the header pin is removed the Energizers adaptive control feature will again operate.

The Smartfence Energizer complies to rigorous international safety standards.

MX25000 TECHNICAL PERFORMANCE





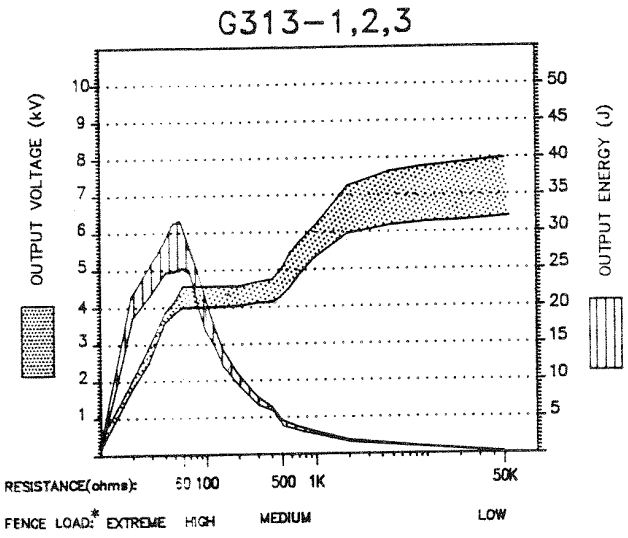
Shaded areas indicate range of output due to supply voltage, component tolerance and temperature variations.

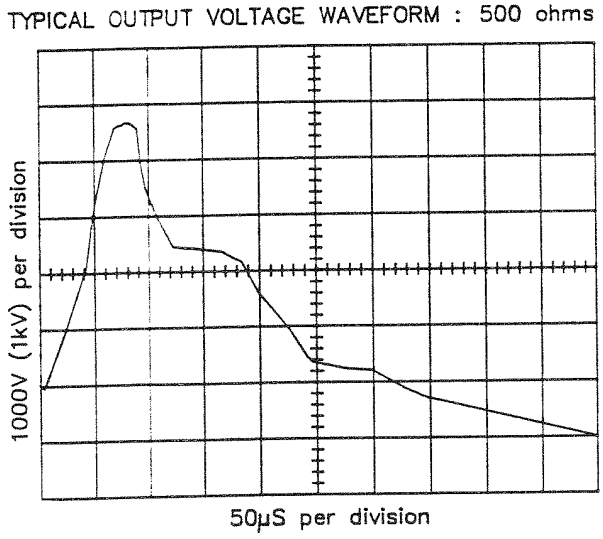
Standard specifications:

1,2,3 NZ/Aust./Int./Europe 220-240Vac 50Hz
IEC 1011

* Fence Load relative to energizer capability.

MX5000 TECHNICAL PERFORMANCE





Shaded areas indicate range of output due to supply voltage, component tolerance and temperature variations.

Standard specifications:

1,2,3 NZ/Aust./Int./Europe 220-240Vac 50Hz
IEC 1011

* Fence Load relative to energizer capability.

Chapter 7

SMARTFENCE SERVICE GUIDE

The Smartfence range of Energizers use several self diagnostic checks to ensure that the Energizer and all its features operate correctly. When these checks find something out of the ordinary it is indicated by 'E' and some number (e.g. E10). The meaning of the possible message is given below.

MX Energizer Self Diagnostic Message

Message	Test
E1-E3	Not Used
E4-E10, E14	Production testing checks. Used when factory testing Energizers
E11-E13	Not Used
E15	Storage capacitor voltage reset test Energizer resets voltage within 3 minutes
E16	Incorrect Installation. Check that the Earth and Output terminals are connected correctly

The self diagnostic messages E4-E10 and E14 are for the detection of manufacturing faults when the Energizer is assembled. In the field they detect the incorrect operation of the Energizer or the failure of a component of part of the Energizer circuitry. If these self diagnostic messages are displayed, the unit will need to be sent to a service centre for repair. When the Energizer is returned it should be accompanied by a description of the fault and the situation in which the unit was operating so as to enable effective repair. The self diagnostic messages E15 and E16 do not require the Energizer to be serviced.

The E15 message can be displayed if the Energizer has adapted up (i.e. the stored energy is greater than 7J) and then the Energizer is switched off at the mains before the Energizer fires the next pulse. When the Energizer is turned on again it may have more than 7J stored energy. The Energizer will display E15 while reducing the stored energy to 7J. E15 may last up to approximately 3 minutes. The Energizer will then start operation as per normal. The Energizer must operate in this manner to maintain operation in the limits of international safety standards.

The E16 message indicates that the Energizer has been installed incorrectly as there is more voltage on the earth than the fence. Check the fence and earth are connected to the correct terminals. And the earth system is well connected by the use of line clamps.

GALLAGHER SMARTFENCE TECHNICAL MANUAL G312 & G313

General Operation

(July 1994)

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NATIONAL SERVICE CENTRES ONLY

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New Zealand

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TABLE OF CONTENTS

INTRODUCTION

About This Manual

This is the Technical Manual for the Gallagher G312 MX2500 and G313 MX5000 Energizers, and the G413R Remote Control. This manual continues on from the Smartfence Product Support Manual the purpose of which is to provide National Distributors and Approved Service Centres with technical information for the servicing of product. Information contained in this manual is confidential and remains the property of Gallagher Group Limited. It may not be used by, or disclosed to, any other persons or organizations (including area managers, dealers and customers) without the written permission of Gallagher Group Limited.

Chapter 1

SMARTFENCE SERVICE GUIDE

When a fault in normal operation is detected an error message for service information is displayed and the Energizer is disabled. The microcontroller disables the Energizer by setting five control bits, the SCR1, SCR2, SCR3 and SCR4 DISABLE, and the TRIAC DISABLE. The TRIAC DISABLE bit stops the storage capacitor charging, the SCR DISABLE bits stop the triggering of the four SCRs. **This results in no output from the Energizer.**

The error conditions indicated as self-retesting will restart the Energizer in 3 seconds. If the fault has been removed the Energizer will operate as per normal, but if the Energizer is still faulty then the Energizer will be disabled again for 3 seconds in the some manner.

For servicing information the following error messages are displayed.

Error :	Fault :	Self retesting
E1	Not Used	-
E2	Not Used	-
E3	Not Used	-
E4	A/D reference	✓
E5	Fence input	×
E6	Earth input	×
E7	Return input	×
E8	Pulse detection	×
E9	Mains detection	✓
E10	Triac	✓
E11	Not Used	-
E12	Not Used	-
E13	Not Used	-
E14	Cap voltage sense	✓
E15	Cap overcharging	✓
E16	Incorrect Install	✓

NOTE For a complete copy of Smartfence Energizer top-overlays and circuit diagrams refer to the end of this chapter.

UNDERSTANDING THE ERROR MESSAGE

E1 (Not Used)

E2 (Not Used)

E3 (Not Used)

E4 A/D reference

Microcontroller A/D reference pin is reading low. Normal operation can not continue all A/D readings will be incorrect.

Possible causes:	Possible solutions:
Voltage on microcontroller A/D reference pin is low	Check voltage reference circuitry. Replace voltage reference. Check 15 V supply

E5 Fence input

A fence input fault is indicated if the fence input voltage measurement circuitry is continuously reading a full scale measurement.

Possible causes:	Possible solutions:
Some fault in the fence input voltage circuitry is resulting in a high reading on the fence A/D pin.	Check for solder bridges and other faults with measurement circuitry. (Micro pin18 especially)

E6 Earth input

A earth input fault is indicated if the earth input voltage measurement circuitry is continuously reading a full scale measurement.

Possible causes:	Possible solutions:
Some fault in the earth input voltage circuitry is resulting in a low reading on the earth A/D pin	Check for solder bridges and other faults with measurement circuitry. (Micro pin16 especially)

E7 Return input

A return input fault is indicated if the return input voltage measurement circuitry is continuously reading a full scale measurement.

Possible causes:	Possible solutions:
Some fault in the return input voltage circuitry is resulting in a low reading on the fence A/D pin.	Check for solder bridges and other faults with measurement circuitry. (Micro pin17 especially)

E8 Pulse detection

The microcontroller checks the fence pulse detection circuitry is operating correctly by checking that each time the SCRS are triggered a corresponding fence pulse is detected. This ensures the pulse detection circuitry is operating correctly so the Energizer can despond to the remote control.

Possible causes:	Possible solutions:
Pulse detection signal staying high or low	Check pulse detection circuitry Check for loose connection of capacitor board wireset to J105
Pulse detect signal not received when SCRs triggered.	Check the Storage Capacitors are charging If the Energizer pulsed then displayed E8 then the problem is with the pulse detection circuitry. If the Energizer charges the storage capacitors up and then goes E8 then check the SCRs and triggering circuitry (both primary and turbo).

E9 Mains detection

This Energizer triggers both the storage capacitor SCRS and the charging circuit triac on the mains zero crossings to minimise RFI and to reduce components being over stressed. lf the mains signal if absent for greater than 125 ms the mains detection fault is indicated.

Possible causes:	Possible solutions:
Fault on mains detection circuitry	Check for solder bridges and other faults on mains detection circuitry. (Micro pin 2 especially) Energizer Board - R14, D14, D16 Control Board - Micro pin 2, LN100

E10 Triac

If the triac fails to control the changing, and the storage capacitor voltage increases while the charging should be held off, the Triac fault is indicated. SCRS and triac are disabled.

Possible causes:	Possible solutions:
Triac is faulty and has gone short circuit. A short circuit between triac cathode and anode	Replace triac Remove short circuit Energizer Board Q2, R15 Control Board Q100, R101, R106, Micro pin 23 Check 15V rail

E11 Not Used

E12 Not Used

E13 Not Used

E14 Capacitor voltage sense

A capacitor voltage sense fault is indicated if the input voltage measurement continuously reads a full scale measurement.

Possible causes:	Possible solutions:
A high signal is present on the capacitor voltage (CV) pin	Check for solder bridges in CV circuit Energizer Board R3, R9 Control Board Micro pin 19

E15 Storage capacitor overcharged

In the event of the Triac going uncontrolled, the microcontroller as described in the triac error indication E10 will disable the Energizer. lf the Energizer is then turned off and then on again, the capacitor voltage will be above the normal maximum operating level of 850 V. In this event the Energizer will display the E15 message and disable the Energizer until the capacitor voltage internally discharges to 450 V, when the Energizer with start operating as per normal.

Possible causes:	Possible solutions:
Normal operation - Capacitor Voltage is higher than it should be	Allow capacitors to discharge
Triac charging storage capacitors in an uncontrolled manner.	Replace faulty triac and allow storage capacitors to discharge

E16 Incorrect installation

An installation fault is indicated if the output terminals are connected incorrectly. The fault condition checked every 3 seconds with a pulse.

Possible causes:	Possible solutions:
Normal Operation - Fence output terminal connected to earth connection.	Remove fence output terminal from earth connection and connect earth output terminal to earth connection.
Faulty Readings	Check fence pulse measurement circuitry

Quick Checks/Hints

If Backlight does not come on check Vcc is 15V first.

Components are numbered according to the circuit board they are on

Energizer Board	0 - 100
Control Board	100 - 300
Capacitor Connector Board	400 -500
Output Board	500-600

Please indicate if recurring problems occur so that this service guide can be updated and circulated.

Remote Control Servicing

lf the Remote Control has been used incorrectly, terminals reversed or used on a non-Smartfence Energizer then damage may occur to the stack diodes D8-D12. If these diodes are damaged the Energizers output voltage will be reduced when the Remote Control is placed on the fence (the Energizers pulse is shorted to ground via the Remote Controls output transformer). Replace diodes that are short circuit with 3 kv stack diodes (Gallagher part number 2D0553).

Modules :

The following is a summary of the PCB assembles associated with the G312 (Smartfence MX2500) and the G313 (Smartfence MX5000) Energizers.

G313-1,-2,-3 : ENERGIZER MX5000

- 2A0288 PCB ASSY: MX5000 CONTROL
- 2A0290 PCB ASSY: MX5000 ENERGIZER .
- 2A0291 PCB ASSY: MX MEAS CAP, 2MM
- 2A0300 PCB ASSY: MX5000 CAP CONN .
- 2A0301 PCB ASSY: MX O/P MOD

G312-1,-2,-3 : ENERGIZER MX2500

- .2A0304 PCB ASSY: MX2500 CONTROL
- 2A0305 PCB ASSY: MX2500 ENERGIZER .
- 2A0291 PCB ASSY: MX MEAS CAP, 2MM
- 2A0303 PCB ASSY: MX2500 CAP CONN .
- 2A0301 PCB ASSY: MX O/P MOD

As can be seen from above, both Smartfence Energizers use the common PCB assembles MX O/P MOD (2A0301) and MX Meas Cap 2mm (2A0291). It is also possible to use the MX5000 Energizer board as a module replacement for the MX2500 Energizer board if the servicing of the Energizer is urgent and only MX5000 Energizer modules are available.

Chapter 2

RELAY CONTACT

How to install/configure external Alarms, Sirens, Autodialers, etc. to a Smartfence Energizer

The Smartfence Energizer includes a dry relay contact on the control board (2A0304 for the MX2500 and 2A0288 for the MX5000) that can be connected to external equipment. The user must provide access to the internal relay contacts while maintaining that the Energizer case still incorporates full electrical isolation and water ingression resistance.

The relay switches a contact when a alarm condition is set, and is protected with a 1 amp fuse in series with the contact. The relay contact is rated 1 amp resistive and 0.3 amp inductive loads, at 24 volts DC or 120 volts AC.

WARNING : EXTREME CAUTION
Remember to always disconnect the power supply to the Energizer before removing the cover. Exposed mains connections could result in a lethal electric shock.

The relay terminal J100 supplies the 3 connection points N/O (normally open), N/C (normally closed) and COM (common). The 1 amp protection fuse is located directly above the relay terminal and is labelled J106. If the fuse is blown replace with a 1 amp, 250 V fuse, in either a x 1¼" or 5 x 20 mm package. Disconnect all equipment from the mains before replacing the fuse.

The Smartfence Energizer control board does not provide a power supply, so a power supply for the users equipment must be provided by the user.

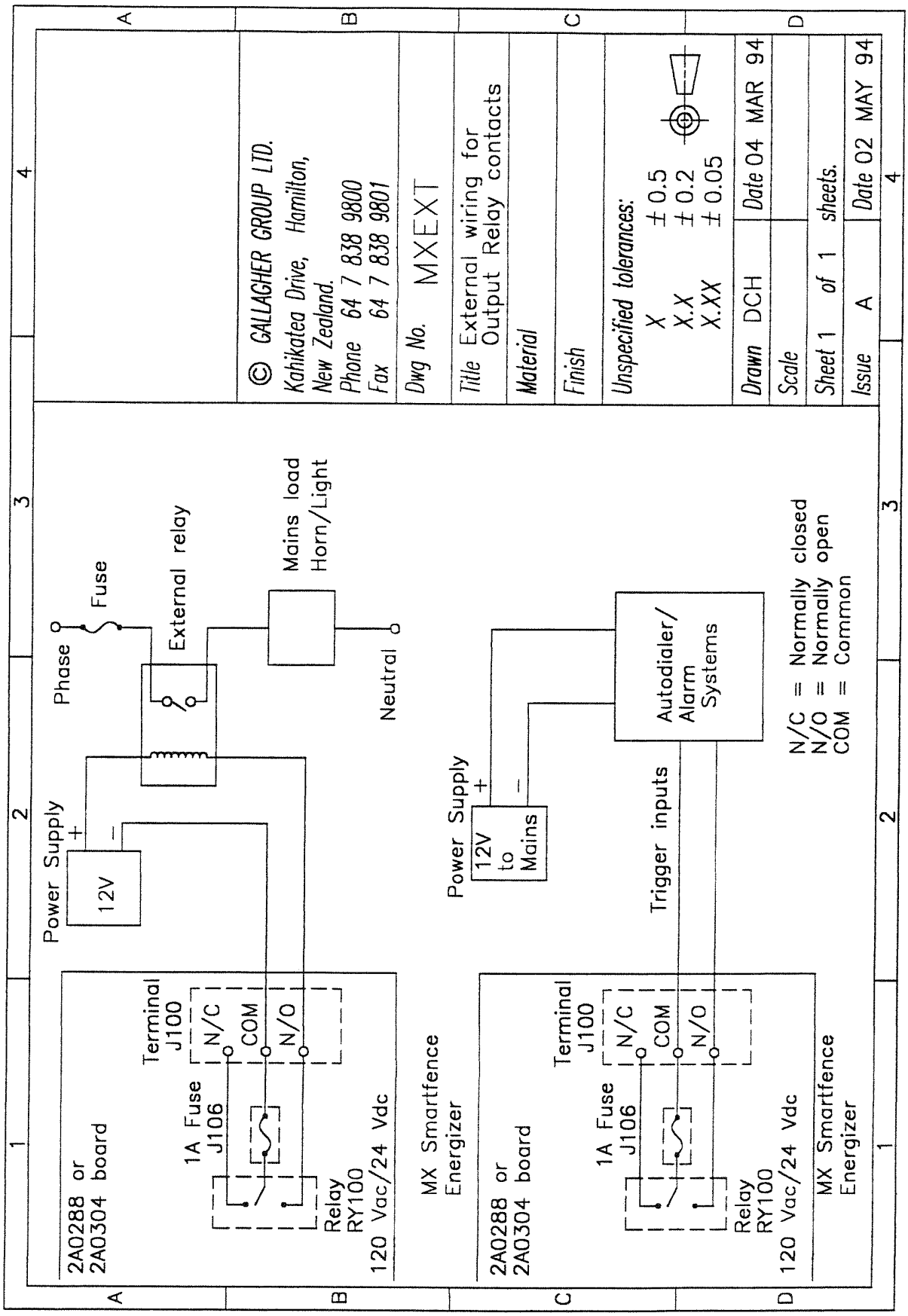
The relay contact may be connected to devices such as autodialers, alarm systems, sirens, lights etc. The relay contact can be used in 2 different ways:

1. In systems such as autodialers, alarms, and systems where the load on the relay contact is fess than 1 amp and the system operates at less than 24 volts DC or 120 volts AC. In these systems the users equipment detects a change in the relays state and takes action accordingly, i.e. activates the relay switch so the autodialer rings out with an alarm message.

2. Where a load (such as a light, horn or siren) is rated at greater than the maximum rating of the relay contacts, the relay contacts must be used to drive an external relay. Any external relay connected must match the external load (i.e. light, siren etc). All mains supply wiring must be carried out by a registered technician.

If using the relay contact ensure the fence in close proximity to the Energizer terminals is free of sparks to avoid false triggering of the relay contact. Basic diagrams of how to connect such devices are shown in the diagram labelled "External wiring for Output Relay Contacts" on the following page. These diagrams are only given as way of an example. The correct circuit will depend on each users application and legal requirement, for example, whether to use the N/C or N/O connection.

NOTE Gallagher Group Ltd does not assume any liability arising out of the application or use of any product or circuit described herein.


© GALLAGHER GROUP LTD.
Kahikatea Drive, Hamilton,
New Zealand.
Phone 64 7 838 9800
Fax 64 7 838 9801
Dwg No. MXEXT
Title External wiring for Output Relay contacts
Material
Finish
Unspecified tolerances:
X ± 0.5
X.X ± 0.2
X.XX ± 0.05
Drawn DCH
Date 04 MAR 94
Scale
Sheet 1 of 1 sheets.
Issue A
Date 02 MAY 94
Power Supply
12V
Phase
Fuse
External relay
Mains load
Horn/Light
Neutral
2A0288 or
2A0304 board
Terminal
J100
1A Fuse
J106
N/C
COM
N/O
Relay
RY100
120 Vac/24 Vdc
MX Smartfence
Energizer
Power Supply
12V
to
Mains
Trigger inputs
Autodialer/
Alarm
Systems
N/C = Normally closed
N/O = Normally open
COM = Common

Chapter 3

CIRCUIT DESCRIPTION

3.1 Control Board

The following description is for both the MX2500 (2A0304) and MX5000 (2A0288) control boards. The associated diagrams that are included at the end of this section are:

- Circuit diagram of MX2500 Control board (2A0304).
- Circuit diagram of MX2500 Control board (2A0288).
- Circuit diagram pf LCD driver circuit on the Control board (2A0288/2A0304)
- Microcontoller pin assignment.
- Component overlay of Control PCB assembly 2A0288/2A0304

U100 is the microcontroller (uC).

- This performs most of the energizers functions and is factory programmed with either the MX2500 or MX5000 energizers software.

Power Supply

C100-102 and EM100 provide the 5V power supply for the microcontroller.

- C100-101 provide additional smoothing for transient switching.
- High frequency by-pass is provided by Ct02.
- EM100 is a low-pass filter which protects the microcontroller power supply from high frequency voltage transients.

Oscillator

R100 and X1-1O0 provide the microcontroller clock signal.

- The clock frequency is 4 MHz

Measurement Reference

C111, R112, U108 provide a voltage reference for the A/D converter on the microcontroller. .

- C111 provides high frequency smoothing.
- R112 limits the regulators peak current drain.
- U108 is a low current, high precision (2.4%) 5 V regulator.

Buzzer

BZ100, Q105, R111 and R143 form the audible buzzer circuit.

- When the microcontroller pulls pin 24 high it flows through R111 and switches Q105 on. As Q105 switches on, R143 limits the voltage across buzzer BZ100 to 12V.

Triac And SCR Drivers
Q100-102, R 101- 103, R106- 108 for the MX2500, plus Q103-l04, R104- 105 and R109-1 10 for the MX5000 drive the Triac and various SCR stages.

- Q100 provides a high current driving capability and isolation for the microcontroller pin when triggering the triac (Q2).
- R 106 limits the maximum current which can flow into the gate of Q2.
- The SCR driver circuitry operates in the same manner as the triac driver described above. The MX2500 drives Q5-6, while the MX5000 drives Q3-6.

Options Selection
R145-146, RN100. SWIOO and U100 form the options selectors.

- The 8 bit DIP switch SW100 and resistor network RN100 enable various software options to be selected. U100 monitors the state of the switches continuously, except for the Remote Identity setting, which is only read on power up or reset. ne options for the Earth, Output and Fence alarms, and the Remote Identity Setting are described in the MX2500/5000 Product Support Manual.

Relay Driver
D112, J100. J106, Q107, R140, R142 and RY100 form the relay driver circuit and provide the external relay contacts.

- U100 pulls pin 6 high when a alarm condition is set, and turns Q107 on.
  This causes the relay RY100 to toggle from N/O (normally open) to N/C (normally closed). Terminal J100 provides external connection to the COM, N/O and N/C dry relay contacts.
- D1 12 shunts reversed current when RYIOO is de-energised.
- R142 limits the voltage across RY100 to 12 V.
- F100 is a one amp fast blow 250 V fuse, located in fuse holder J106.

Power-on Reset
D100, D102, R114-117, U105 monitor the 5V power supply. If the supply voltage is insufficient for reliable circuit operation (ie less than 4.5 V) then the circuitry pulls the microcontroller reset pin low via D102.

- D 100 and R1 16 generate a l .6 V voltage reference.
- Rl15 and R114 from a resistor divider of the Vdd power supply.
- The comparator U105 pulls the reset pin low via D102 until the scaled Vdd signal is greater than the voltage reference. This circuit leaves the microcontroller in reset mode until the Vdd power supply is greater than 4.5V.
- The output of U105 has an "open collector" output with grounded emitter.
- R117 is an external pull-up resistor to provide the output swing for microcontroller U100.
- D102 (with D103) provides a OR function to reset the microcontroller.

Pulse Detection
C109- 110, D104- 105, D107- 108, R125-133, U106 and U105 form the pulse detection circuitry.

- To provide electric isolation between the primary and secondary of the energizer a 2 mm thick PCB board forms a high voltage capacitor. The dielectric strength of the PCB is rated at 60 kV,

and the required creepage clearance of 30 mm is maintained between the primary and secondary sides of the capacitor measurement board (2A029 1).

- C109 forms a capacitor divider with a 40 pF capacitor on the capacitor measurement board (2A0291), on the negative fence pulse signal (which is discharged by R125). D104 and D105 clamp the signal from 0 to 5V.
- Cl10, Dl07- 108, R131 perform the same function for the positive earth pulse signal.
- U106, R132-133 and R126-127 subtracts the negative fence signal from the positive earth signal, to result in a total fence pulse signal.
- The comparator U105 then compares the total fence signal with the reference provided by R128-129. This circuit provide a very sensitive fence pulse detection signal. which is a input to pin 25.
- The output of U105 has an "open collector" output with grounded emitter.
- R130 is an external pull-up resistor to provide the output swing for microcontroller U100.

LCD Backlighting

D101 and R1 13 provide a red light source.

- R113 limits current to the high intensity LED, the light from which is diffused through a perplex block to backlight the LCD in poor light conditions.

Fence Measurement

C114-1 16, D1 10, R137-139 and U106 form the fence measurement circuitry.

- To provide electric isolation between the primary and secondary of the energizer a 2 mm thick PCB board forms a high voltage capacitor. The dielectric strength of the PCB is rated at 60 kV, and the required creepage clearance of 30 mm is maintained between the primary and secondary sides of the capacitor measurement board (2A0291).
- C114 and C116 form a capacitor divider with a 40 pF capacitor on the capacitor measurement board (2A0291). which provides primary and secondary isolation.
- R137 and the trim pot R138 form a resistive divider which allows for calibration of the measurement circuitry (mainly due to tolerance of C114 and C116).
- U106, C115 and D110 form a super diode minimum hold circuit, which is discharged by R139. The op amp has a high slew rate required to accurately track the fast rise timer of the energizer pulses.

Earth Measurement

C112-113, D109, D113, R134-136 and U104 form the earth measurement circuitry.

- To provide electric isolation between the primary and secondary of the energizer a 2 mm thick PCB board forms a high voltage capacitor. The dielectric strength of the PCB is rated at 60 kV, and the required creepage clearance of 30 mm is maintained between the primary and secondary sides of the capacitor measurement board (2A0291).

- C112 forms a capacitor divider with a 10 PF capacitor on the capacitor measurement board (2A029 1), which provides primary and secondary isolation.
- R135 and the trim pot R 134 form a resistive divider which allows for calibration of the measurement circuitry (mainly due to tolerance of C1 12).
- U104, Cl13 and D 109 form a super diode peak hold circuit, which is discharged by R136. The op amp has a high slew rate required to accurately track the fast rise time of the energizer pulses.
- D113 protects U104 from negative earth voltages, which would cause the op amp to go unstable.

Watchdog Reset

C103-105, D103, Q106, R1 18-121, RNIOO and U107 form the watchdog reset timer circuit.

- In normal operation the microcontroller continually toggles output pin Dog (pin 10). If the microcontroller locks-up for any reason then this toggling stops and the watchdog timer generates a reset signal to restart the microcontroller.
- C103 and R118 form a differentiated which turns Q106 on briefly (via R119) whenever the voltage at pin 10 changes state.
- U107, R120-121 and C104 form a standard 555 timer circuit (astable operation). When Q106 turns on its discharges C104 and restarts the timer.
- Otherwise if the mircocontroller pin Dog stops toggling, C104 charges up over the threshold level and U107 generates a low pulse which resets the microcontroller via D103.
- C105 and RN100 provide a time delay during start up which ensures the reset pin is low for sufficient time to allow a proper reset for the microcontroller and gives a further settling period before the microcontroller begins operating.

Output Measurement

C106- 108, D106, R122-124 and U104 form the output measurement circuitry.

- To provide electric isolation between the primary and secondary of the energizer a 2 mm thick PCB board forms a high voltage capacitor. The dielectric strength of the PCB is rated at 60 kV, and the required creepage clearance of 30 mm is maintained between the primary and secondary sides of the capacitor measurement board (2A029 1).
- C106 and C107 form a capacitor divider with the 40 pF capacitor on the capacitor measurement board (2A0291), which provides primary and secondary isolation.
- R122 and the trim pot R123 form a resistive divider which allows for calibration of the measurement circuitry (mainly due to tolerance of C106 and C107).
- U104, C108 and D106 form a super diode minimum hold circuit. which is discharged by R124. The op amp has a high slew rate required to accurately track the fast rise timer of the energizer pulses.

Inputs To Micro
Connector J104 connects the CV and MAINS signals from the energizer board.
Mains (pin 2) senses the mains power supply zero crossings. The CV signal (pin 19) is from a resistor divider across the main storage capacitors C11 and C12, which allows the microcontroller to measure the capacitor voltage.

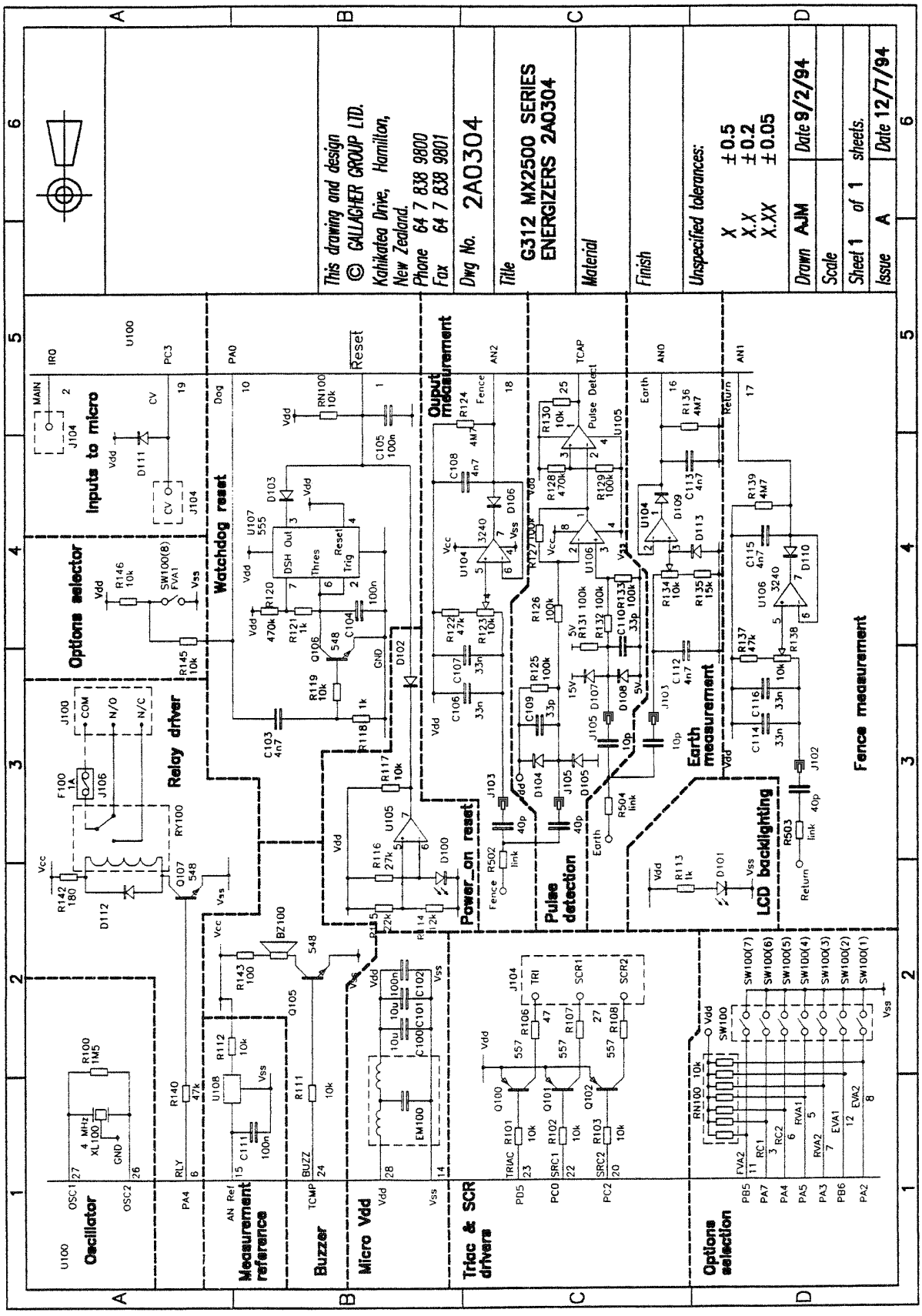
- D111 clamps the scaled capacitor voltage signal to maximum of 5 V.

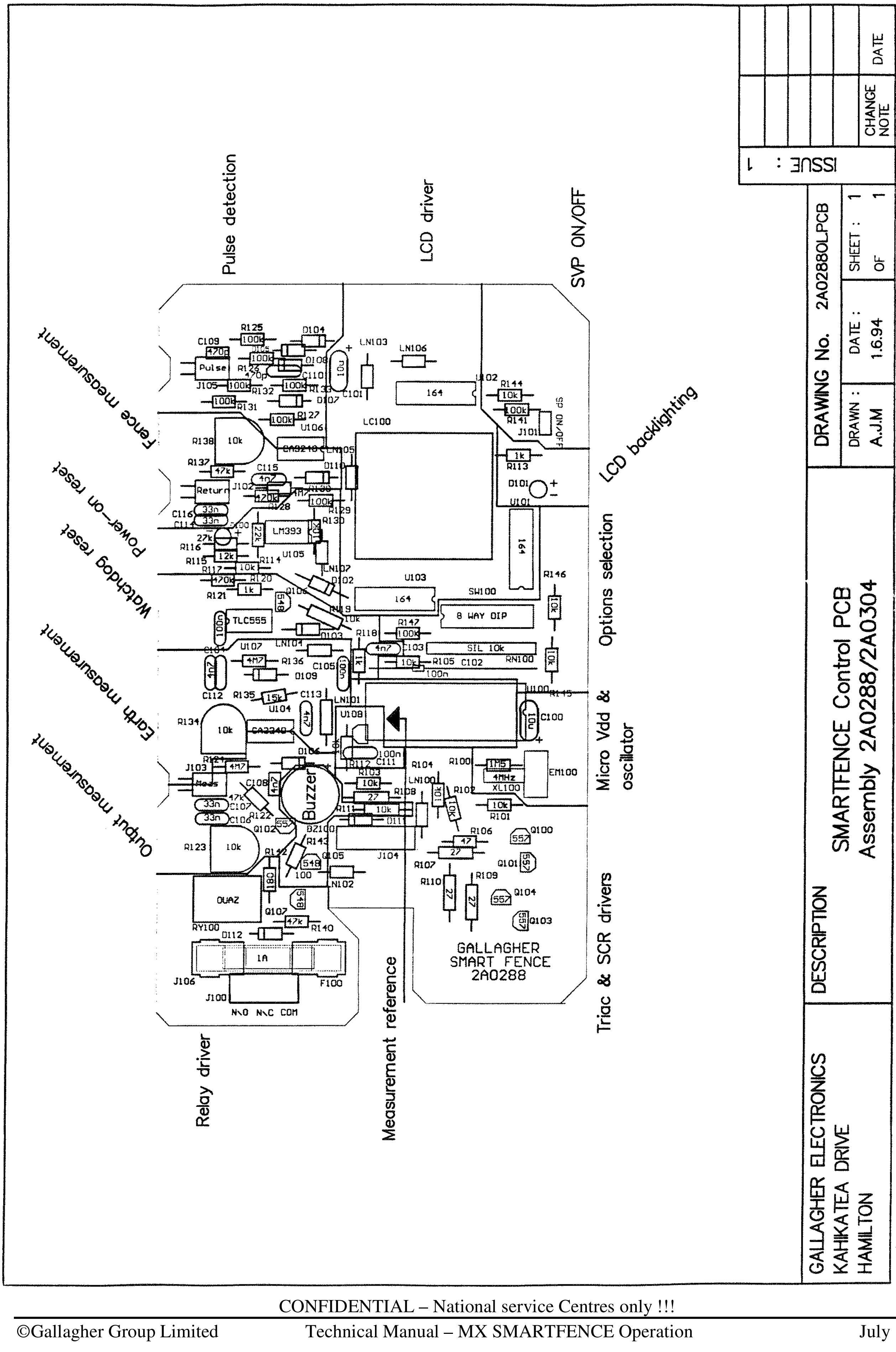
LCD Driver (see LCD driver diagram)
LC100 and U100-103 form the LCD driver and display circuitry.

- The 28 pin LCD (LC100) is driven with a 40 Hz (25 ms period) square waveform from the three 8 bit shift registers U101-103.
- The microcontroller (U100) uses pin 11 (serial data output or SDO) and pin 13 (serial clock or SCK) to send the 28 bits of data for the LCD. This serial port operates at 0.5 MHz to load the LCD data to three 8 bit shift registers U101-103. The microcontroller drives the 0.5 MHz serial port every 12.5 ms to supply the required 40 Hz signal for the LCD.
- Both the serial clock and serial data output pins operate in a dual function.
- When the data to the LCD is being updated they are outputs, but for the remainder of the time they are inputs to read the options selectors as described below.

Options Selection (see LCD driver diagram)
J101, R141, R144, R147, RN100 and SW100 form two additional options selectors.

- The 8 bit DIP switch SWIOO and resistors RNIOO and R147 enable various software options to be selected. The options for the Earth, Output and Fence alarms, and the Remote Identity Setting are described in the MX2500/5000 Product Support Manual.
- The jumper J101 and resistors R141 and R144 disable the adaptive control.
- When the link is in place, the energizer will only operate at a 7 J stored energy level for calibration. Normally the link is removed so the will adapt to the fence system load.


This drawing and design
© GALLAGHER GROUP LTD.
Kahikatea Drive, Hamilton,
New Zealand.
Phone 64 7 838 9800
Fax 64 7 838 9801
Dwg No. 2A0304
Title
G312 MX2500 SERIES
ENERGIZERS 2A0304
Material
Finish
Unspecified tolerances:
X ±0.5
X.X ±0.2
X.XX ±0.05
Drawn AJM
Date 9/2/94
Scale
Sheet 1 of 1 sheets.
Issue A
Date 12/7/94
Inputs to micro
Options selector
Watchdog reset
Output measurement
Relay driver
Power_on reset
Pulse detection
Earth measurement
LCD backlighting
Fence measurement
Oscillator
Measurement reference
Buzzer
Micro Vdd
Triac & SCR drivers
Options selection



Pulse detection
LCD driver
SVP ON/OFF
LCD backlighting
Options selection
Micro Vdd & oscillator
Triac & SCR drivers
Measurement reference
Relay driver
Fence measurement
Power-on reset
Watchdog reset
Earth measurement
Output measurement
GALLAGHER SMART FENCE 2A0288
DATE
CHANGE NOTE
ISSUE : 1
DRAWING No. 2A0288OLPCB
DRAWN : A.J.M
DATE : 1.6.94
SHEET : 1 OF 1
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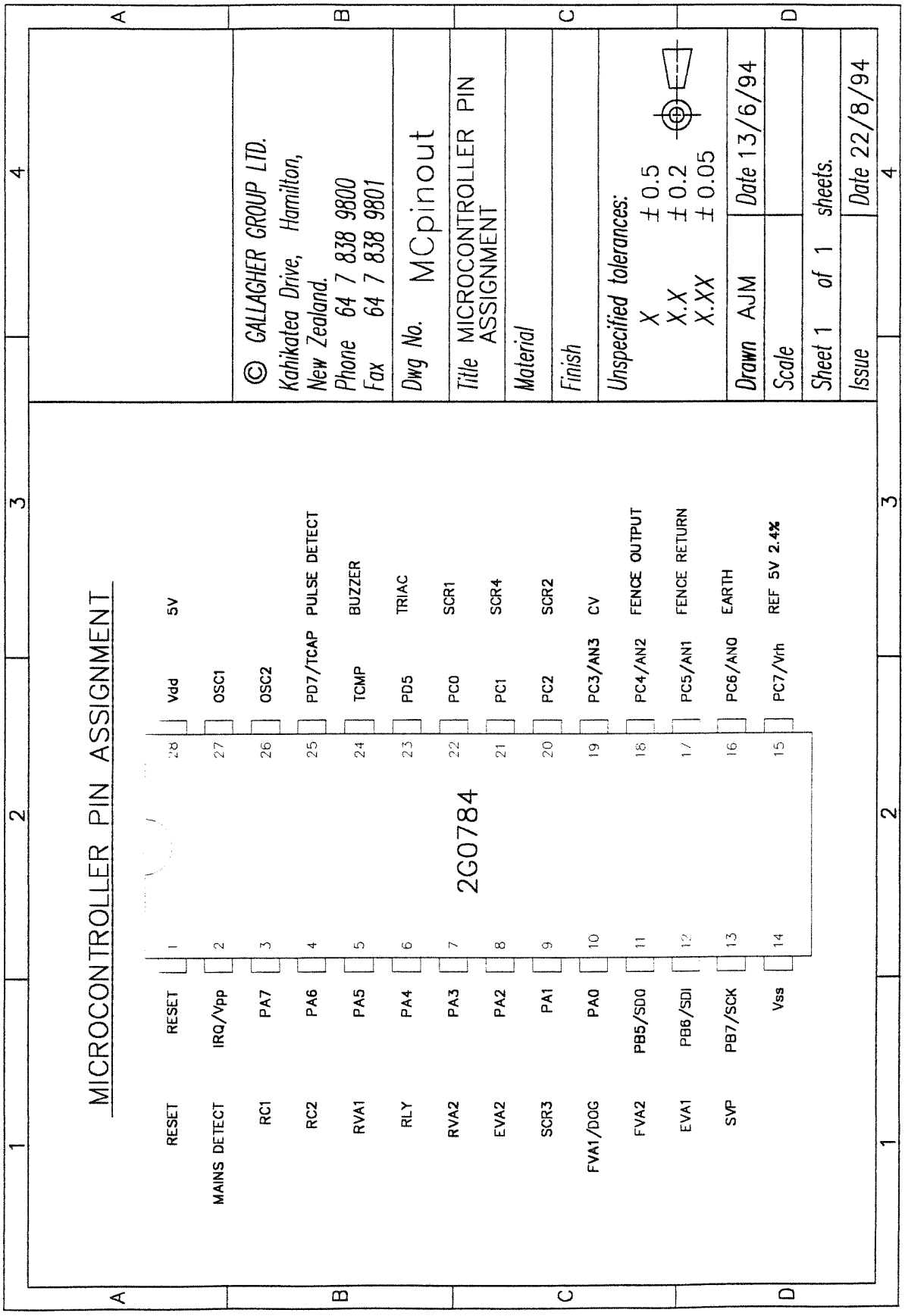
SMARTFENCE Control PCB
Assembly 2A0288/2A0304
GALLAGHER ELECTRONICS
KAHIKATEA DRIVE
HAMILTON


MICROCONTROLLER PIN ASSIGNMENT
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MAINS DETECT
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RC2
RVA1
RLY
RVA2
EVA2
SCR3
FVA1/DOG
FVA2
EVA1
SVP
RESET
IRQ/Vpp
PA7
PA6
PA5
PA4
PA3
PA2
PA1
PA0
PB5/SDO
PB6/SDI
PB7/SCK
Vss
Vdd
OSC1
OSC2
PD7/TCAP
TCMP
PD5
PC0
PC1
PC2
PC3/AN3
PC4/AN2
PC5/AN1
PC6/AN0
PC7/Vrh
5V
PULSE DETECT
BUZZER
TRIAC
SCR1
SCR4
SCR2
CV
FENCE OUTPUT
FENCE RETURN
EARTH
REF 5V 2.4%
2G0784
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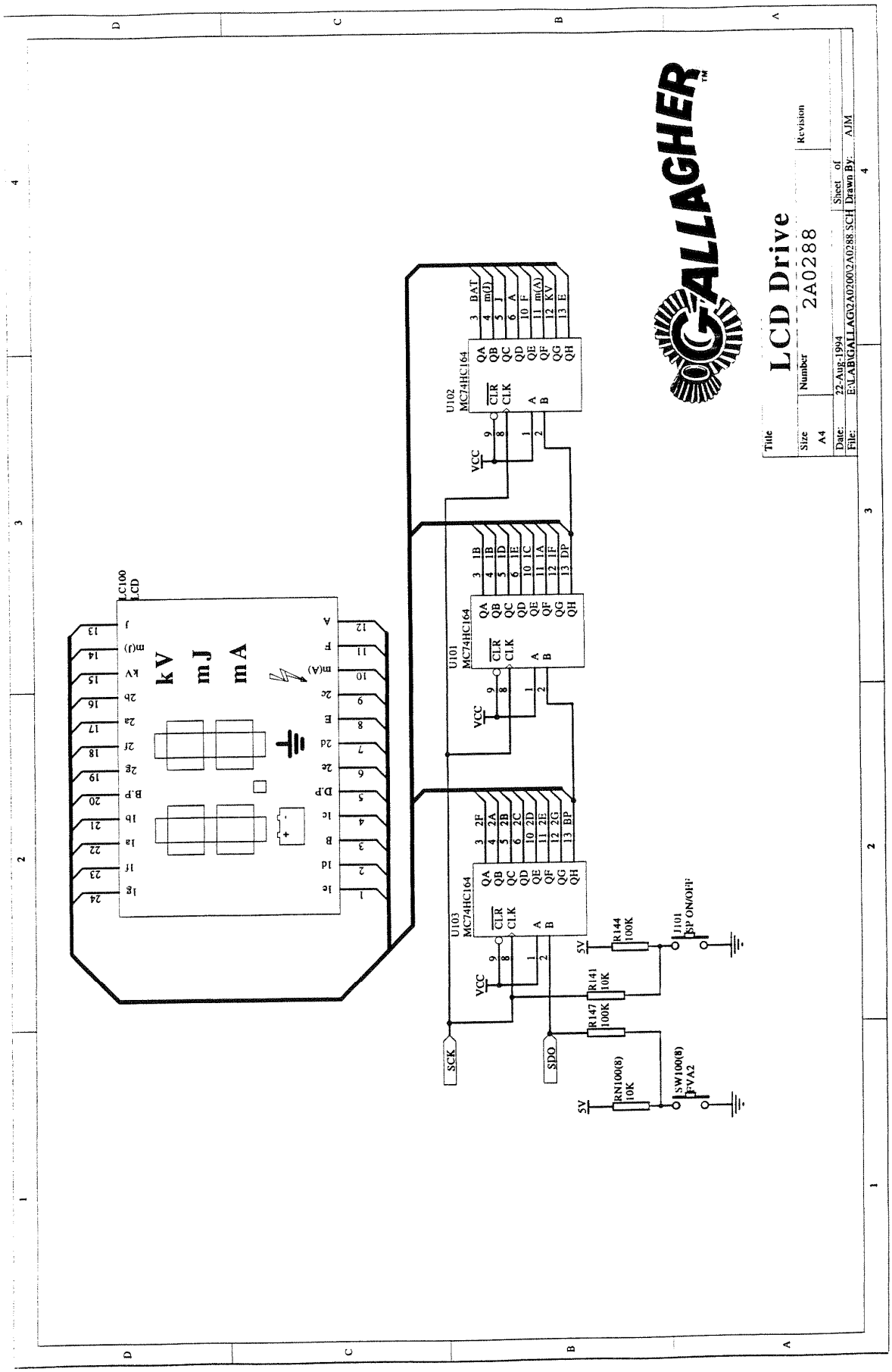
Kahikatea Drive, Hamilton,
New Zealand.
Phone 64 7 838 9800
Fax 64 7 838 9801
Dwg No. MCpinout
Title MICROCONTROLLER PIN ASSIGNMENT
Material
Finish
Unspecified tolerances:
X ± 0.5
X.X ± 0.2
X.XX ± 0.05
Drawn AJM
Date 13/6/94
Scale
Sheet 1 of 1 sheets.
Issue
Date 22/8/94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mA
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VCC
5V
SCK
SDO
R144 100K
R141 10K
R147 100K
RN100(8) 10K
SW100(8) FVA2
J101 SP ON/OFF

3.2 Energizer Board.

The following description it for both the MX2500 (2A0305) and MX5000 (2A0290) energizer boards. The associated diagrams that are included at the end of this section are :

- Circuit diagram of MX2500 Energizer board (2A0305).
- Circuit diagram if MX$000 Energizer board (2A0190).
- Component overlay of MX5000 Energizer PCB assembly 2A0290.
- Component overlay of MX2500 Energizer PCB assembly 2A0305.

Vcc and Vdd DC Power Supply

C1-C4, C9, D1-D3, Q1, R1 and R2 form the Vcc and Vdd DC Power supply circuit.

- R1 and C1 basically form a low pass filter across the mains, to filter RFI and to smooth voltage spikes on the mains.
- R2, C2, C9, D1 and D2 form a voltage multiplier that charges C3. Very similar to voltage doubler. R2, C2 and C9 limit the current flowing through D3.
- C3 is a smoothing capacitors for Vcc 15 V.
- D3 is a zener diode clamping VCC to 15 V.
- Q1 is a 7805 5 V regulator that provides Vdd 5 V.
- C4 is a smoothing capacitor for Vdd 5 V.

Mains Zero Crossing Detection

D14, D16 and R14 form the mains zero crossing detection circuit.

- R14 limits current so the mains zero crossing is just a high impedance voltage sense line.
- D14 and D16 clamp the mains voltage from R14 to below 5 V and above 0 V respectively. This creates a 0-5 V square wave in synchronization with the mains signal which is feed to the microcontroller.

Voltage Quadrupler Charging Circuit

C5-C7, D4-D10, L2, Q2, R4-R8 and R15 form the Voltage Quadrupler Charging Circuit.

- D4-D10, C5-C7 form a voltage quadrupler charging circuit which charges storage capacitors C11 and C12 for the MX2500 plus C9 and C10 for the MX5000.
- R4, R5, R8 discharge their respective capacitors at power off.
- R6 and R7 limit the charging current into the storage capacitors.
- Q2 triac controls the charging circuit. When charging Q2 is triggered every 500 µs and conducts. When not charging Q2 is not conducting.
- VDR R15 clamps the Voltage across triac Q2 to below 800 V.
- L2 limits the instantaneous current when C5, C6 and C7 are discharged and Q2 begins conducting.

Main Storage Capacitors

C11 and C12 are the main storage capacitors and D400, D401, R3 R9 R400 are associated circuitry.

- C11 and C12 are the main storage capacitors that are charged to between 500-900 V.
- R400, D400 and D40l provide a path for current undergoing to dissipate when the main storage capacitors are discharged.
- R3 and R9 form a voltage divider network to scale down 500-900 V on C11 and Cl2 to 0-5 V for the microcontroller input via pin 19. R3 and R9 are both 1% tolerance. Voltage on C9 and C10 is assumed to be the same.
- These resistors also discharge the main storage capacitors at power off.

Turbo Storage Capacitors (MX5000 only)
C9 and C 10 are the turbo storage capacitors and D402, D403, R402, R401 are associated circuitry.

- C9 and C10 are the turbo storage capacitors that are charged to between 500 - 900 V.
- R401, D402 and D403 provide a path for current undergoing to dissipate when the turbo storage capacitors are discharged by Q3 and Q4.
- R402 discharges the turbo storage capacitors at power off.

Main Primary Circuit
D13, D17, Q5, Q6, R10, R1 1 and T1 form the main primary circuit.

- Q5 and Q6 are triggered simultaneously to discharge C11 and C12 through L1 and T1 . 2 SCRS are connected in series for reliability at 900 V CV.
- R10 and Rl1 prevent interference falsely switching Q5 and Q6 on.
- D13 is required to allow Q5 to be triggered directly from microcontroller, as the cathode of Q5 is at approximately half CV.
- D17 shunts any negative voltage spikes that occur across Q6.
- T1 is the main output transformer.

Turbo Primary Circuit (MX5000 only)
D11, D12, D15. Q3, Q4. R12. R13 and T2 form the main primary circuit.

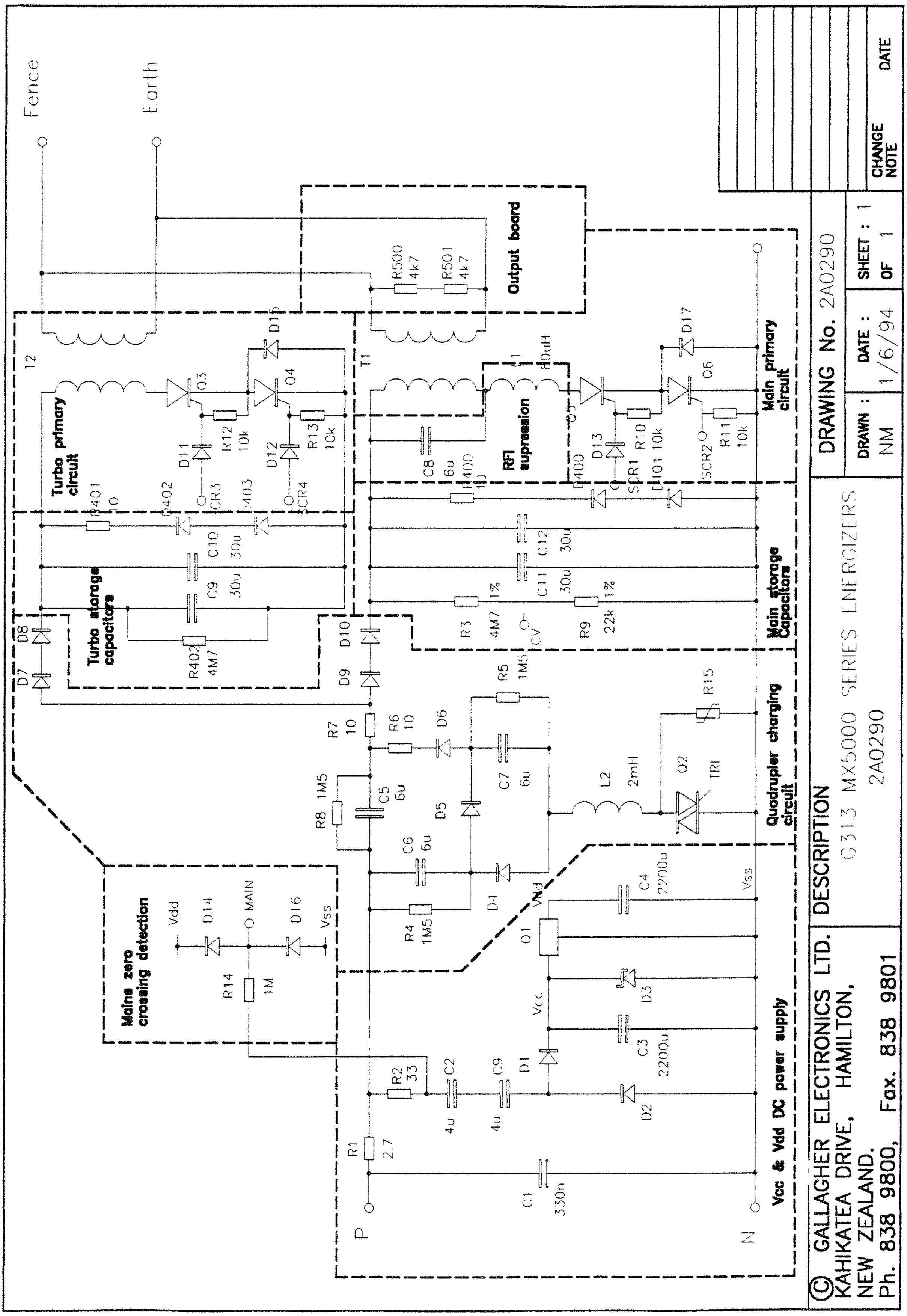
- Q3 and Q4 are triggered simultaneously to discharge C9 and C10 through T2. 2 SCRS are connected in series for reliability at 900 V CV.
- R12 and R13 prevent interference falsely switching Q3 and Q4 on.
- D11 is required to allow Q3 to be triggered directly from microcontroller, as the cathode of Q3 is at approximately half CV.
- D12 is used to carry the trigger current for Q4.
- D15 shunts any negative voltage spikes that occur across Q4.
- T2 is the turbo output transformer.

RFI Suppression Circuitry
C8 and L1 form the RFI suppression circuitry.

- L1 limits high frequency currents in output transformer.
- C8 limits high frequency voltages or interference across output transformer.

Output Board .
R500 and R501 form the output circuit .

- R500 and R501 clamp the peak output voltage below 10 kV when an external capacitive load is across the energizer output terminals.


Fence
Earth
Output board
Turbo primary circuit
Turbo storage capacitors
RFI supression
Main primary circuit
Main storage capacitors
Quadrupler charging circuit
Mains zero crossing detection
Vcc & Vdd DC power supply
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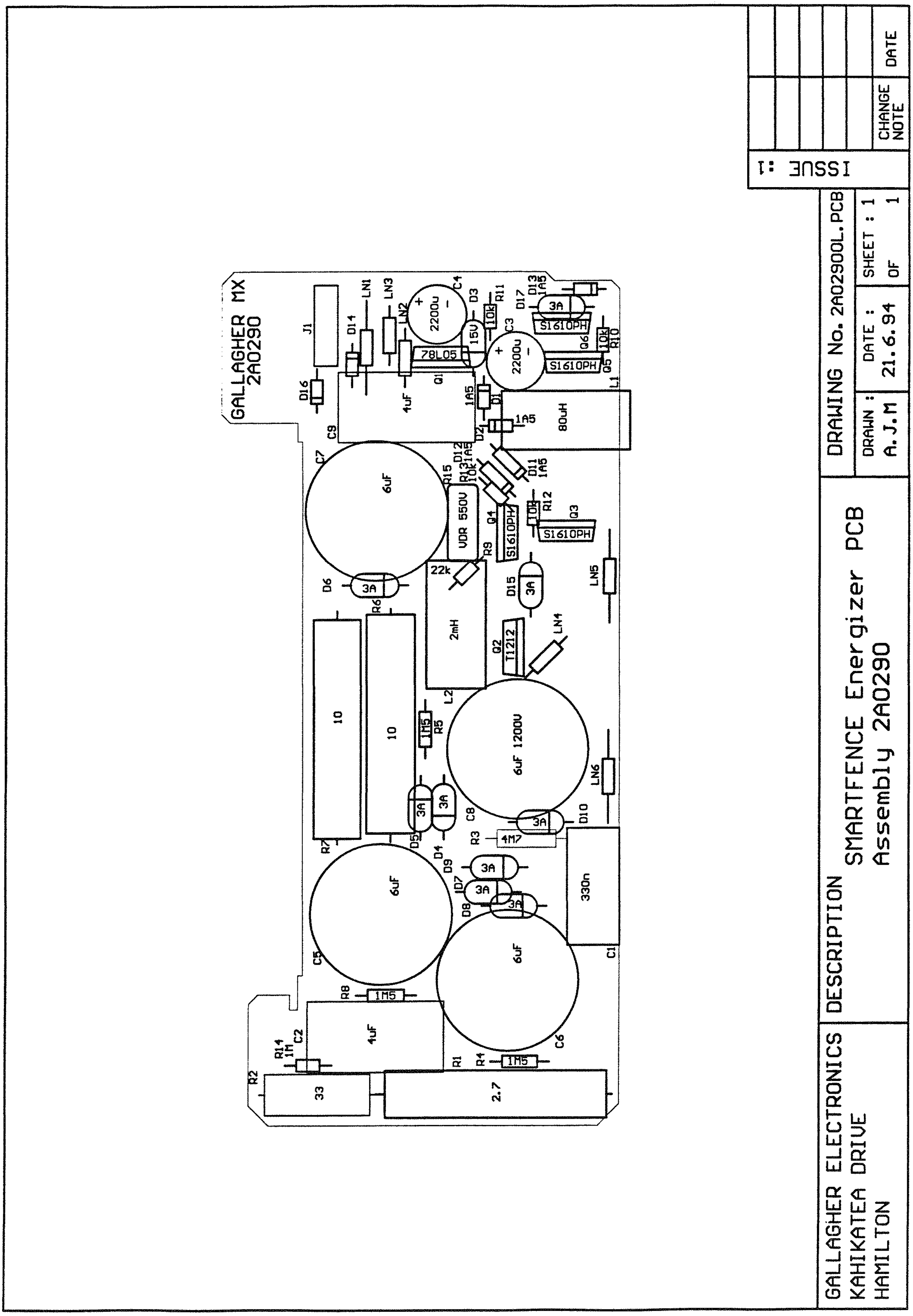
DRAWN : NM
DATE : 1/6/94
SHEET : 1 OF 1
CHANGE NOTE
DATE
DESCRIPTION
G313 MX5000 SERIES ENERGIZERS
2A0290
© GALLAGHER ELECTRONICS LTD.
KAHIKATEA DRIVE, HAMILTON,
NEW ZEALAND.
Ph. 838 9800, Fax. 838 9801


GALLAGHER ELECTRONICS
KAHIKATEA DRIVE
HAMILTON
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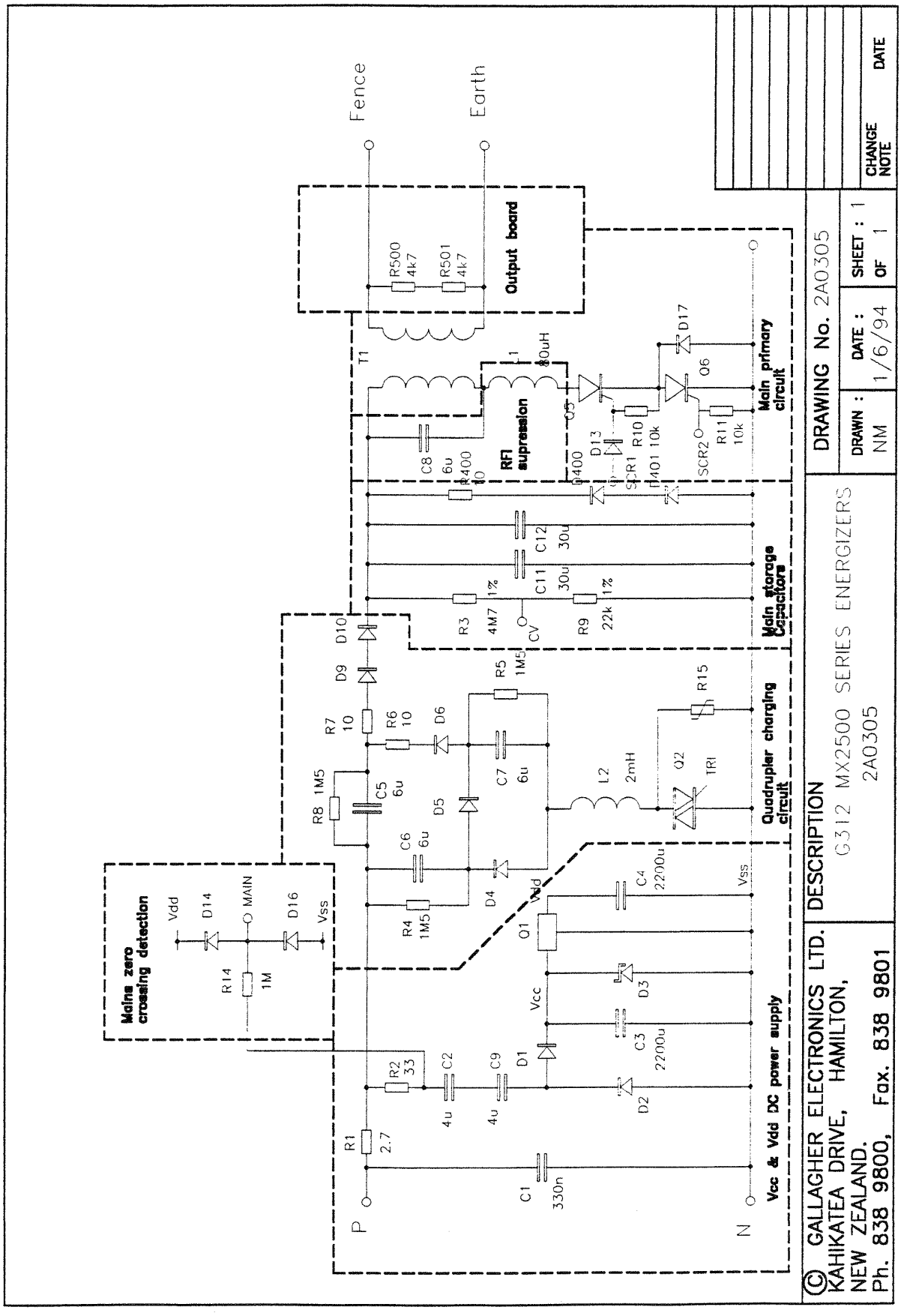
GALLAGHER MX
2A0290


Fence
Earth
Output board
R500 4k7
R501 4k7
T1
L1 40uH
RFI supression
Main primary circuit
Main storage Capacitors
Quadrupler charging circuit
Vcc & Vdd DC power supply
Mains zero crossing detection
MAIN
Vdd
Vss
Vcc
P
N
CV
SCR1
SCR2
Q1
Q2
Q5
Q6
D1
D2
D3
D4
D5
D6
D9
D10
D13
D14
D16
D17
R1 2.7
R2 33
R3 4M7 1%
R4 1M5
R5 1M5
R6 10
R7 10
R8 1M5
R9 22k 1%
R10 10k
R11 10k
R14 1M
R15
R400 10
R401 10k
C1 330n
C2 4u
C3 2200u
C4 2200u
C5 6u
C6 6u
C7 6u
C8 6u
C9 4u
C11 30u
C12 30u
L2 2mH
1RI
© GALLAGHER ELECTRONICS LTD.
KAHIKATEA DRIVE, HAMILTON,
NEW ZEALAND.
Ph. 838 9800, Fax. 838 9801
DESCRIPTION
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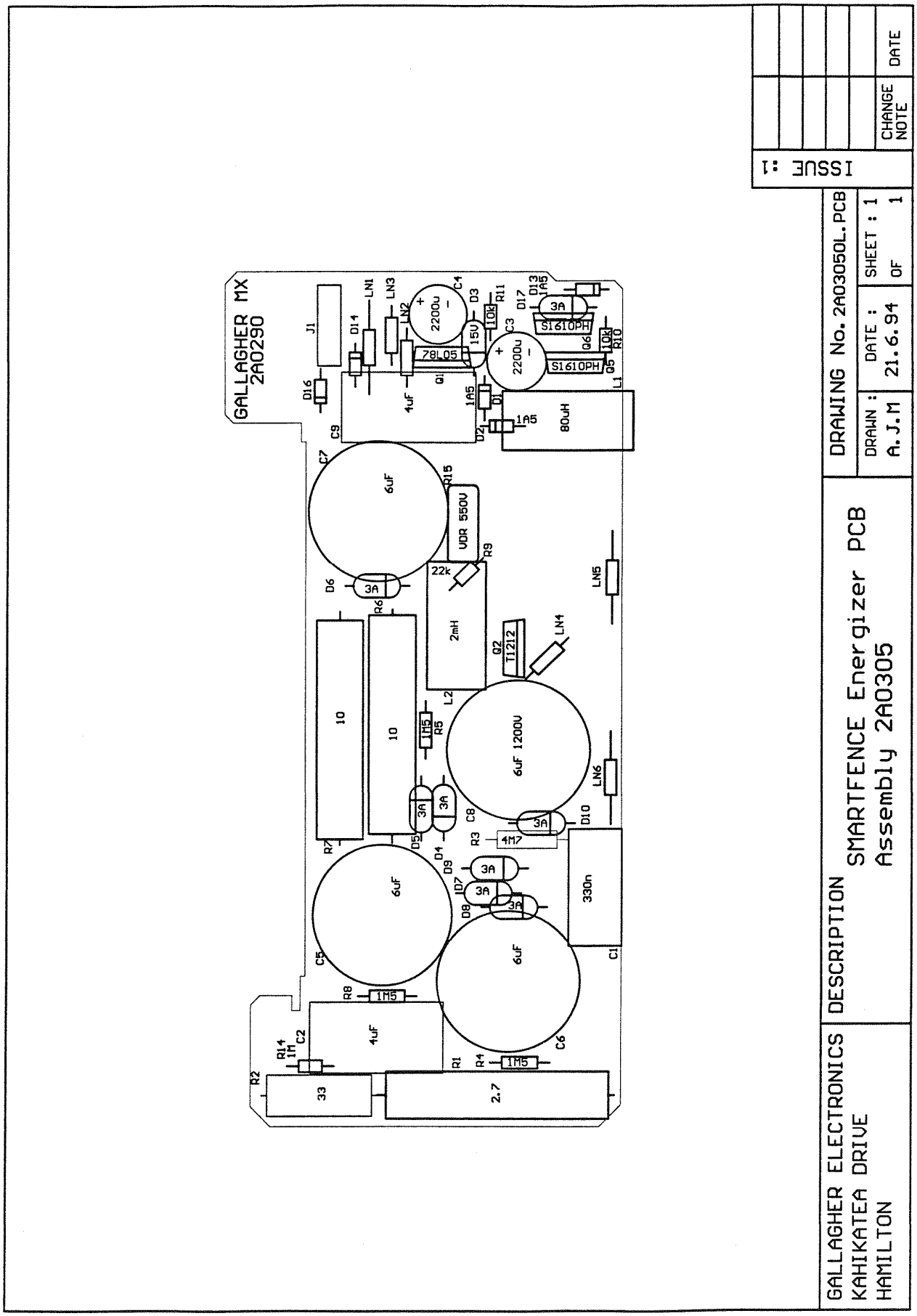
DATE : 1/6/94
SHEET : 1 OF 1
CHANGE NOTE
DATE


GALLAGHER MX
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LN1
LN3
LN2
D14
C4
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D3
R11
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D17
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S1610PH
Q6
10k
R10
C3
2200u
15V
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Q5
L1
80uH
D16
1uF
1A5
D1
D2
1A5
C9
C7
6uF
R15
VDR 550V
R9
22k
D6
3A
R6
2mH
L2
Q2
T1212
LN4
LN5
10
10
1M5
R5
6uF 1200V
LN6
3A
3A
3A
C8
D10
R7
D5
D4
R3
4M7
D9
3A
D7
3A
D8
3A
330n
C5
6uF
6uF
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ISSUE :1
CHANGE NOTE
DATE
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DRAWN : A.J.M
DATE : 21.6.94
SHEET : 1 OF 1
DESCRIPTION
SMARTFENCE Energizer PCB
Assembly 2A0305
GALLAGHER ELECTRONICS
KAHIKATEA DRIVE
HAMILTON

3.3 Remote Control Board

The following description is for the XRI (2A0287) Smartfence Remote Control Board. The associated diagrams that are included at the end of this section are :

- . Circuit diagram of XRI Remote Control board.
- . Component overlay of Remote Control PCB assembly.

The two basic functions of the remote control are :
a) Pulse detect indicator to show when fence voltage is above 0.1 kV.
b) Deliver a high frequency pulse train to toggle the energizer between standby and normal operating mode, or vice versa.

U1 is the microcontroller (uC).

- This performs most of the remote control functions and is factory programmed with the XR1 remote control software.
-

Power Supply
EMI. C6-9 and U3 provide the 5V DC power supply for the microcontroller.

- DC power is supplied to the microcontroller from a type "216" 9 V battery.
- C8 prevents excessive surge currents through the regulator during power-up, and provides additional smoothing for transient switching.
- U3 is a low standby current (typically 2 uA). 5 V, 5% voltage regulator.
- C7 and C9 provide additional smoothing for transient switching.
- High frequency by-pass is provided by C6.
- EMI is a low-pass filter which protects the microcontroller power supply from high frequency voltage transients.

Membrane Switch
C2, J1. U1 and a membrane switch form user input to the remote control.

- J1 is a zero insertion force connector for the tail of the membrane switch.
- The microcontroller U1 has a internal pull down resistor on pin 5, which with C2 forms a RC circuit to stretch the closure of the membrane switch in time. This pulse stretching ensures that the microcontroller detects the switch closure when awaking from STOP mode.

Low Battery
Q6, R15 and R17-18 form a low battery voltage sense circuitry.

- R17 (2%) and R18 (1%) form a resistor divider on the storage capacitor voltage.
- When the capacitor voltage exceeds 150 V, the voltage on R18 reaches approximately 0.6 V and turns Q6 on, so U1 senses a low signal on pin 12. If U1 doesn't detect that the capacitor voltage exceeded 150 V in all five charging cycles, then when the remote control fires the 5 signal pulses, and the microcontroller Ul indicates a low battery condition with the led indicator.

Pulse Detection

D3-6, Q2 and R8-13 form the pulse detection circuitry.

- D3-6 from a bridge rectifier so the remote control can sense both negative and positive electric fence pulses.
- The resistor divider network R9 - 13 will turn Q2 on when the fence voltage exceeds 100 V.
- When Q2 turns on and pulls pin 4 of U1 low, an interrupt is generated, and the microcontroller indicates a fence pulse was detected.
-

LED Indicator

D2, R2 and U1 form the display circuitry

- U1 switches high current sinking pin 9 to directly drive LED D2 through current limiting R2.

Oscillator

XL1 provides the microcontroller clock signal.

- The clock frequency is 4. Mhz
- No external stability resistor is required as the microcontroller has a internal 2 MΩ resistor between OSC1 and OCS2.

Inverter Charger

Q3-4, R6. R14 and T1 form the inverter circuitry.

- The inverter circuit is driven at a constant frequency with a 5.5 kHz square waveform (180 µs duty cycle). This is the optimum frequency to charge the main storage capacitor (C5) to the maximum voltage within the charging period of 32 ms.
- At the start of the charging cycle U1 pulls pin 2 low, current flows through R14 and turns on Q3, which in turn causes Q4 to turn on. Current flows from the 9 V battery through Q4 and the primary of T1 until the current reaches a maximum and it stops rising. This negative di/dt causes a small voltage spike across the primary winding of T1 (V= - di/dt) which is then transform onto the secondary winding of T1.
- After 90 µs U1 pulls pin 2 high, causing both Q3 and Q4 to switch off. When Q4 suddenly switches off, it causes a large negative di/dt through the primary of T1 inducing a large voltage spike across the winding (V= - di/dt). This large spike is induced onto the secondary winding of T1 and conducts via D7 to charge the main storage capacitor C5.

SCR Driver And High Voltage Output

Q7, R3, R7 and R19 form the SCR discharge circuitry.

- R3 holds Q7 off until switched on by the microcontroller.
- R7 limits the maximum current which can flow into the gate of Q5.
- After the Inverter circuit charges the main storage capacitor C5 for the charging period of 32 ms, the microcontroller U1 pulls pin 3 low. Current flows through R19 and switches Q7 on. Q7 and R19 provides a high current driving capability and buffer for the microcontroller pin when switching the SCR (Q5) on.

C5, D8-l3, Q5 and T2 form the discharge and high voltage pulse output circuitry.

- Q5 discharges the energy stored in the main storage capacitor C5 via the primary winding of the output transformer T2. This transfers the output pulse onto the secondary winding of T2 and the output terminals.
- D8-13 protect T2 from the high voltage, high energy pulses by blocking the main negative part of the energizer pulse.

Power-on reset

C1 and R1 form the power-on reset circuitry.

- C1 and R1 provide a time delay during start up which ensures the reset pin is low for sufficient time to allow a proper reset for the microcontroller and gives a further settling period before the microcontroller begins operating.
- D1 provides a OR function of the watchdog reset and the power-on rest to reset the microcontroller.

Watchdog Reset

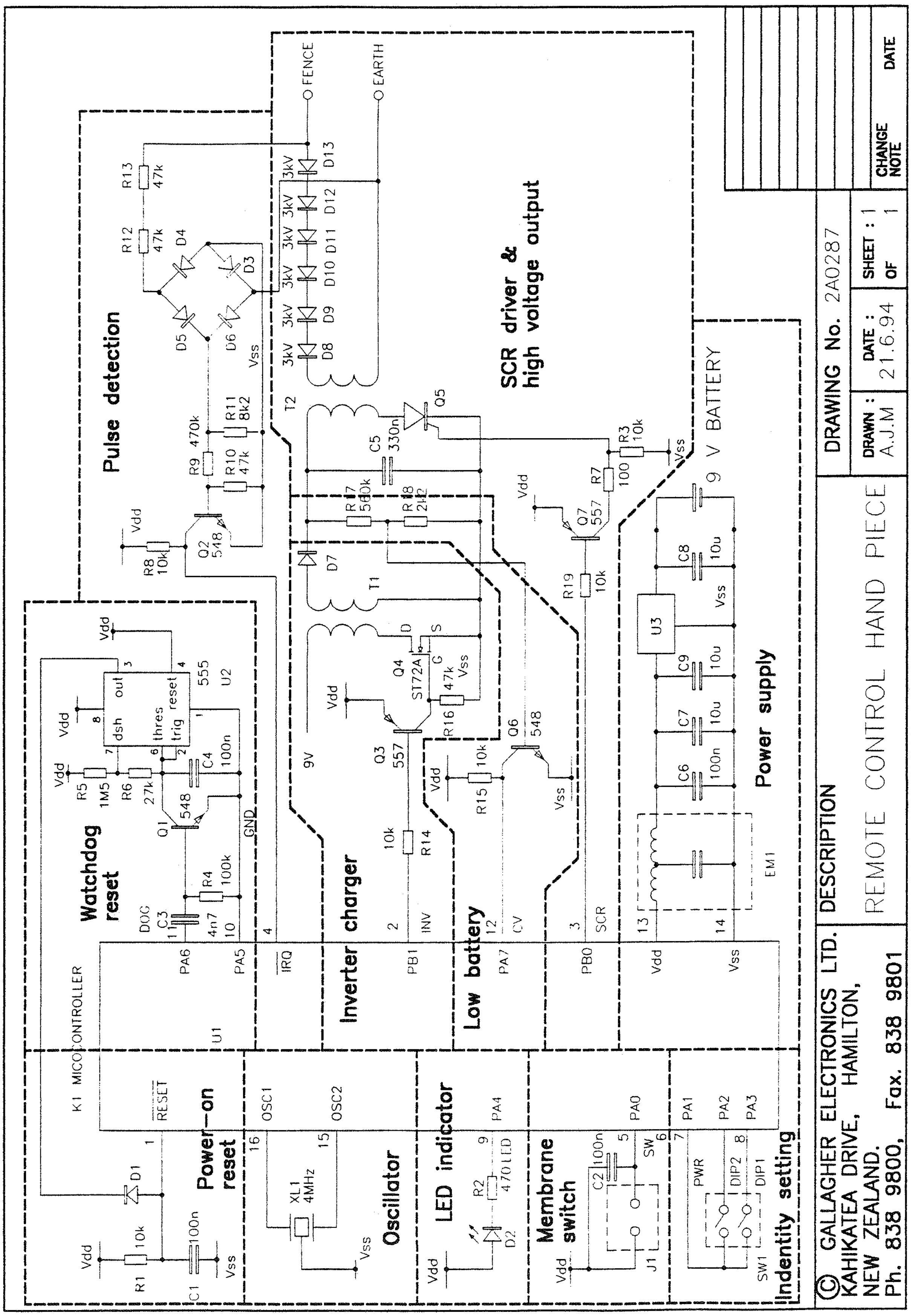
C3-4, D1. Ql, R4-6. U1 and U2 form the watchdog reset timer.

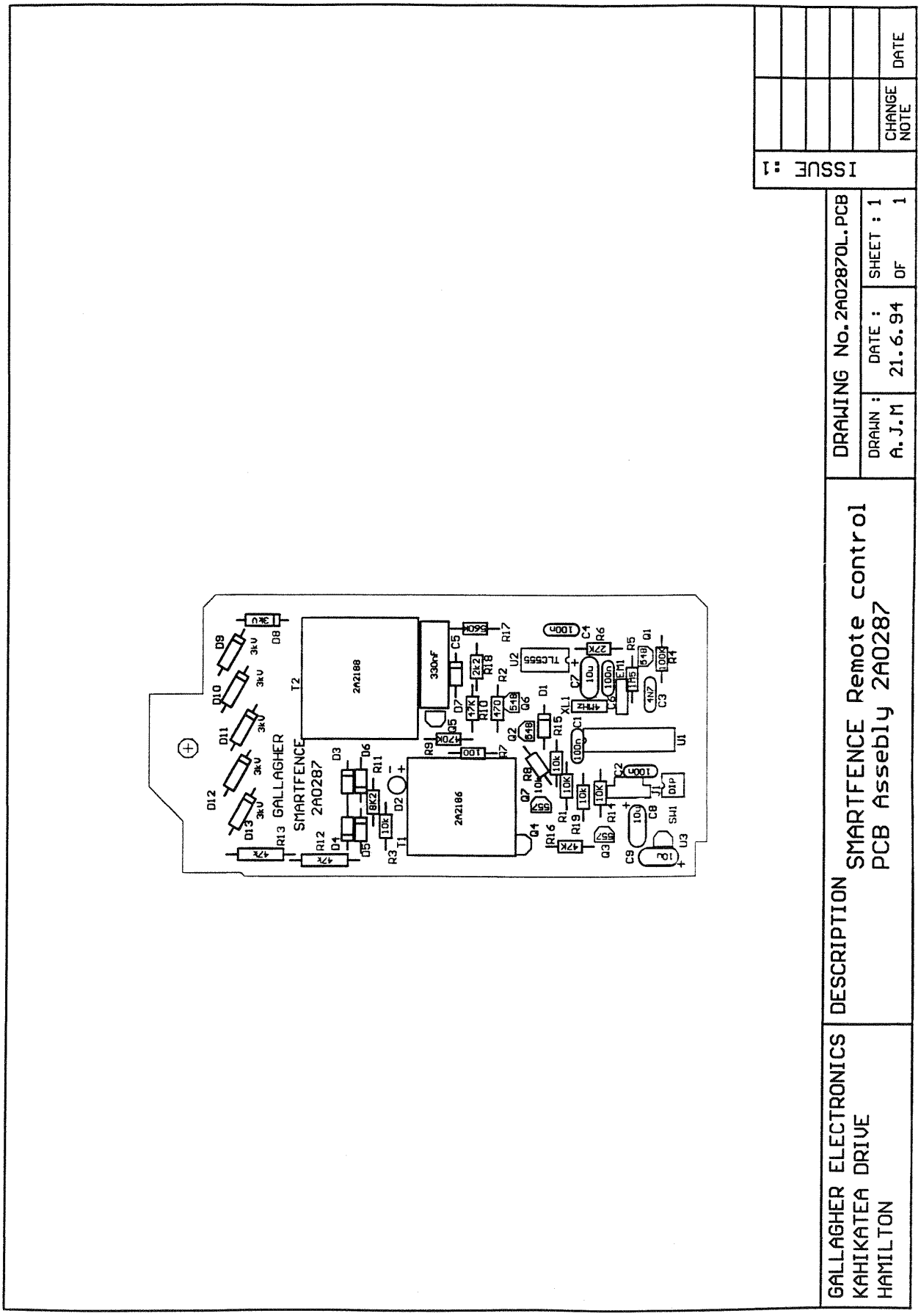
- In normal operation the microcontroller U1 continually toggles output pin Dog (pin l1). If the microcontroller locks-up for any reason, this toggling stops and the watchdog timer generates a reset signal to restart the microcontroller.
- C3 and R4 form a differentiated which turns Q1 on briefly whenever the voltage at pin l1 changes state.
- C4, R5, R6 and 172 form a standard 555 timer circuit (astable operation). When Q1 turns on C4 is discharged and restarts the timer. Otherwise if the mircocontroller pin Dog stops toggling, C4 charges up over the threshold level and U2 generates a low pulse which resets the microcontroller via D1.
- Pin 10 of the microcontroller is pulled low when the remote control is operating to power the watchdog reset timer circuitry. When the microcontroller goes into standby mode by executing the STOP instruction, pin 10 is pulled high to stop any current consumption by U2 and associated circuitry. This measure and others results in the standby current of the circuit of typically 2 µA.

Identity setting

SW1 and U1 provide the remote identity setting code to change the pulse train signalling frequency. This setting is matched to the energizer setting code.

- SW1 is used to select one of four identity settings for the remote control.
- When the remote is operating pin 7 goes high, and pins 7 & 8 switch on internal pull down resistors and reads SW1. When the remote control goes into standby mode the pull downs are switched off and pin 7 goes low again. This is to minimise the standby current consumption of the circuit.


Pulse detection
SCR driver &
high voltage output
FENCE
EARTH
9 V BATTERY
Watchdog reset
Inverter charger
Low battery
Power supply
Power-on reset
Oscillator
LED indicator
Membrane switch
Indentity setting
K1 MICOCONTROLLER
U1
555
U2
XL1 4MHz
ST72A
© GALLAGHER ELECTRONICS LTD.
KAHIKATEA DRIVE, HAMILTON,
NEW ZEALAND.
Ph. 838 9800, Fax. 838 9801
DESCRIPTION
REMOTE CONTROL HAND PIECE
DRAWING No. 2A0287
DRAWN : A.J.M
DATE : 21.6.94
SHEET : 1 OF 1
CHANGE NOTE
DATE


GALLAGHER ELECTRONICS
KAHIKATEA DRIVE
HAMILTON
DESCRIPTION
SMARTFENCE Remote control
PCB Assembly 2A0287
DRAWN : A.J.M
DATE : 21.6.94
DRAWING No.2A0287OL.PCB
SHEET : 1 OF 1
ISSUE :1
CHANGE NOTE
DATE
SMARTFENCE
GALLAGHER
2A0287
2A2188
2A2186
330nF
TLC555
T1
T2
U1
U2
U3
SW1
DIP
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
Q1
Q2
Q3
Q4
Q5
Q6
Q7
C1
C2
C3
C4
C5
C6
C7
C8
C9
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
XL1

Chapter 4

Bills of Materials (BOMs)

Part Number : 2A0288 Date : 17/07/94
Description : PCB ASSY: MX5000 CONTROL Page 1 of 2

Part	Description	Qty	Cct-Ref
2A4413-1	PCB: MX CONTROL VER 1	1.	
2A8002	SOFTWARE ASSY:MX5000 VER1	1	U100
2B0000	RESISTOR ZERO 0HM LINK	8	LN100-107
2B1049	RESISTOR: 100,MF,0.25W,5%	1	R143
2B1055	RESISTOR: 180,MF,0.25W,5%	1	R142
2B1073	RESISTOR: 1K,MF,0.25W,5%	3	R113,1 18,121
2B1097	RESISTOR: 10K,MF,0.25W,5%	10	R101-105.111-1 2,117,119
2B1097	RESISTOR: 10K,MF,0.25W.5%	3	R141,145- 46
2B1099	RESISTOR: 12K,MF,0.25W,5%	1	R114
2B1101	RESISTOR: 15K.MF,0.25W.5%	1	R135
2B1105	RESISTOR: 22K.MF.0.25W,5%	1	R115
2B1107	RESISTOR: 27K,MF,0.25W,5%	1	R116
2B1113	RESISTOR: 47K,MF,0.25W,5%	2	R122,137
2B1113	RESISTOR: 47K,MF,0.25W.5%	1	R140
2B1121	RESISTOR: 100K,MF,0.25W,1%	7	R125-127,129,131-133
2B1121	RESISTOR: 100K,MF,0.25W,1%	2	R144,147
2B1137	RESISTOR: 470K,MF,0.25W,5%	2	R120,128
2B1149	RESISTOR: 1M5,MF,0.25W,5%	1	R100
2B1161	RESISTOR: 4M7,MF,0.25W,5%	3	R124,136,139
2B1235	RESISTOR: 27,MF,0.5W,5%	4	R107-110
2B1241	RESISTOR: 47,MF,0.5W,5%	1	R106
2B3005	RESISTOR T/POT 10K OHM HORIZ	3	R123,134,138
2B5002	RESISTOR;10K SIL, 8 X BUSSED	1	RN100
2C0411	CAP: 100N|SOV,CER	4	C102,104-105,111
2C0460	CAP: 33P.50V,CER	2	C109-110
2C0509	CAP: 33N,100V.MKT,10%.PC5.08	4	C106-107,114,116
2C0517	CAP: 4N7,100V,CER,5.08MM	5	C103,108,112-113,115
2C0522	CAP: 10U,I6V,TAN, ,PC2.5	2	C100-101
2D0501	DIODE: GP,IKV,1A	1	D112
2D0544	DIODE: SG,75V	10	D102-111
2D0544	DIODE: SG,75V	1	D113
2D5001	LED: RED 3MM DIFFUSED	1	D100
2D5010	LED: RED 3MMD WC HB	1	D101
2E0605	TRN: SS,P	5	Q100-104
2E0608	TRANSISTOR NPN SMALL SIGNAL	3	Q105-107
2G0716	I.C. LINEAR OP-AMP CA3240E	2	U104,106
2G0736	IC COMPARATOR DUAL 8 PIN 1.	1	U105

Part Number : 2A0288 Date : 17/07/94
Description : PCB ASSY: MX5000 CONTROL Page 2 of 2

Part	Description	Qty	Cct-Ref
2G0765	LCD: CUSTOM 2X7 SEGMENT Z4PIN	1.	LC100
2G0780	REG: 5V.T0-92,2.4%,16UA	1.	U108
2G0781	IC;8 BIT SERIAL SHIFT REGISTER	3.	U101-l03
2G0782	IC: TIMER 555,CMOS	1.	U107
2M1006	TERMINAL: BLOCK 3-PIN	1.	J100
2M1008	BUZZER: 12V	1.	BZ100
2M1022	PIN HEADER:40X2, 0.1",	0.025	J101
2M1106	FUSE :1A. 250V, (NON UL/CSA)	1.	F100
2Ml120	RELAY: DPDT, 12V	1.	RY100
2M1123	CERAMIC RESONATOR 4MHZ	1.	XL100
2M1158	LIGHT DIFFUSER. 2G0765	1.	
2M1162	FILTER:EMI SUPPRESSION LC TYPE	1.	EM100
2M1176	SWITCH: 8WAY DIP,SPST	1.	SW100
2M1177	RECEPTACLE:12 WAY PCB	1.	J104
4E4349	CLIP:FUSE PCB 1.25", 20MM	2.	J106
4E4351	TERMINAL:VERT. 2 WAY. 2MM	3	J102-103,105
4E4354	IC:SOCKET 28 PIN,DIL	1.	

Part Number : 2A0300 Date : l7/07/94
Description : PCB ASSY : MX5000 CAP CONN Page 1 of 1

Part	Description	Qty	CctrRef
2A4421-1	PCB: MX CAP CONN	1.	
2B1945	RESISTOR: 4M7,MF,1W,1%,HVT	1.	R402
2B2649	RESISTOR: 10,WW,10W	2.	R400-40
2D0560	DIODE: SR.1KV,3A	4.	D400-403
4E4225	TERMINAL FUSEHOLDER SPECIAL	8.	
4E4266	FASTON TAB :6.3MM R/ANGLE PCB	3.	

Part Number: 2A0304 Date : 17/07/94
Description : PCB ASSY: MX2500 CONTROL Page 1 of 2

Part	Description	Qty	Cct-Ref
2A4413-1	PCB: MX CONTROL VER 11.		
2A8005	SOFTWARE ASSY:MX2500 VERI	1.	U100
2B0000	RESISTOR ZERO OHM LINK	8.	LN100-107
2B1049	RESISTOR: 100,MF,0.25W,5%	1.	R143
2B1055	RESISTOR: 180,MF,0.25W,5%	1.	R142
2B1073	RESISTOR: IK,MF,0.25W,5%	1	R113,118,121
2B1097	RESISTOR: 10K,MF,0.25W,5%	8.	R101-103,111-112,117,119
2B1097	RESISTOR: 10K,MF,0.25W,5%	3.	R141,145-146
2B1099	RESISTOR: 12K,NM,0.25W,5%	1.	R114
2B1101	RESISTOR: 15K,NM,0.25W,5%	1.	R135
2B1105	RESISTOR: 22K,MF,0.25W,5%	1.	R115
2B1107	RESISTOR: 27K,MF,0.25W,5%	1.	R116
2B1113	RESISTOR: 47K,MF,0.25W,5%	2.	R122,137
2B1113	RESISTOR: 47K,MF,0.25W,5%	1.	R140
2B1121	RESISTOR: 100K,MF,0.25W,I%	T	R125-127,129,130-133
2B1121	RESISTOR: 100K,MF,0.25W,l%	2.	R144,147
2B1137	RESISTOR: 470K,MIF,0.25W,5%	2.	R120,128
2B1149	RESISTOR: IM5,MF,0.25W,5%	1.	R100
2B1161	RESISTOR: 4M7,MF,0.25W,5%	I	R124,136,139
2B1235	RESISTOR: 27,MF,0.5W,5%	2.	R107-108
2B1241	RESISTOR: 47,MF,0.5W,5%	1.	R106
2B3005	RESISTOR T/POT 10K OHM HORIZ	3.	R12T131138
2B5002	RESISTOR 10K SIL, 8 X BUSSED	1.	RN100
2C0411	CAP: 100N,50V,CER	4.	C102,104-105,111
2C0460	CAP: 33P,50V,CER	2.	C109-110
2C0509	CAP: 33N,100V,MKT,10%,PC5.08	4.	C106-107,114,116
2C0517	CAP: 4N7,100V,CER,5.08MM	I	C103,108,112-113,115
2C0522	CAP: 10U,16V,TAN,,PC2.5	2.	C100-101
2D0501	DIODE: GP,1KV,1A	1.	D112
2D0544	DIODE: SG,75V	11.	D102-1 11, D 113
2D5001	LED: RED 3MM DIFFUSED	1.	D100
2D5010	LED: RED 3MMD WC HB	1.	D101
2E0605	TRN: SS,P	3.	Q100-102
2E0608	TRANSISTOR NPN SMALL SIGNAL	3.	Q105-107
2G0716	I.C. LINEAR OP-AMP CA3240E	2.	U104,106
2G0736	IC COMPARATOR DUAL 8 PIN	1.	U105
2G0765	LCD: CUSTOM 2X7 SEGMENT 24PIN	1.	LC100
2G0780	REG: 5V,TO-92,2.4%,16UA	1.	U108
2G0781	IC;8 BIT SERIAL SHIFT REGISTER	3.	U101-103

Part Number: 2A0304 Date : 17/07194
Description : PCB ASSY: MX2500 CONTROL Page 2 of 2

Part	Description	Qty	Cct-Ref
2G0782	IC: TIMER SSS,CMOS	1.	U107
2M1006	TERMINAL: BLOCK 3-PIN	1.	J100
2M1008	BUZZER: 12V	1.	BZ100
2M1022	PIN HEADER:40X2, 0.1”,	0.025	J101
2M1106	FUSE: lA, 250V, (NON UL/CSA)	1.	F100
2M1120	LAY: DPDT, 12V	1.	RY100
2M1123	CERAMIC RESONATOR 4MHZ	1.	XL100
2M1158	LIGHT DIFFUSER, 2G0765	1.	
2M1162	FILTER:EMI SUPPRESSION LC TYPE	1.	EM100
2M1176	SWITCH: 8WAY DIP,SPST	1.	SW100
2M1177	RECEPTACLE: 12 WAY PCB	1.	J104
4E4349	CLIP:FUSE PCB 1.25", 20MM	2.	J106
4E4351	TERMINAL:VERT, 2 WAY, 2MM	3.	J102-103,105
4E4354	IC:SOCKET 28 PIN,DIL	1.	

Part Number: 2A0303 Date : 17/07/94
Description : PCB ASSY : MX2500 CAP CONN Page 1 of 1

Part	Description -	Qty	Cct-Ref
2A4421-1	PCB: CAP CONN	1.	
2132649	RESISTOR: 10,10W	1.	R400
2D0560	DIODE: SR,lKV,3A	2.	D400-401
4E4225	TERMINAL FUSEHOLDER SPECIAL	4.	
4E4266	FASTON TAB :6.3 R/ANGLE PCB	3.	

Part Number: 2A0290 Date : 17/07/94
Description : PCB ASSY:MX5000 ENERGIZER Page 1 of 1

Part	Description	Qty	Cct-Ref
2A3053	INDUCTOR: 80UH,BROWN	1.	L1
2A3054	INDUCTOR: 2MH,WHIT'E	1.	L2
2A4412-1	PCB: MX ENERGIZER VER 1	1.	
2B0000	RESISTOR ZERO OHM LINK	6.	LN1-6
2B1097	RESISTOR: l0K,MF,0.25W,5%	4.	R10-13
2B1105A	RESISTOR: 22K,MF,0.25W,1 %	1.	R9
2B1145	RESISTOR: IM,MF,0.25W,5%	1.	R14
281549	RESISTOR: IMS,MF,0.25W,5%,HVT	3.	R4-5,8
2B1945	RESISTOR: 4M7,MF,1 W,1 %,HVT	1.	R3
2B2462	RESISTOR: 33,WW,SW,10%	1.	R2
2B2635	RESISTOR: 2.7,WW,10W	1.	RI
2B2649	RESISTOR: 10,WW,10W	2.	R6-7
2B4004	VDR: MEOX,550V	1.	R15
2C0438	CAP: 330N,250V,MKT,10%	1.	C1
2C0443	CAP: 2200U,16V,PCE	2.	C3-4
2C0468	CAP: 4U,250VAC,MKT,,MATSUSH	2.	C2,9
2C0505	CAP: 6U,900V,MKP,10%	3.	C5-7
2C0530	CAP: 6U,1200V,120A,MKP,10%	1.	C8
2D0504	DIODE: AV,1KV,1.SA	5.	D1-2,11-13
2D0544	DIODE: SG,75V	2.	D14,16
2D0560	DIODE: SR,1 KV,3A	9.	D4-10,15,17
2D0591	DIODE:ZE, 15V, SW	1.	D3
2F0648	TRIAC 800V 12AMP	1.	Q2
2F0657	SCR 1000V 40A ITSM 500A	4.	Q-6
2G0769	REGULATOR 7805 SV 1.SA	1.	Q1
2K1509	WIRESET:12 WAY RIBBON,60 MM	1.	J1
4E4338	FASTON RECEPTACLE 6.3MM	6.	
4G4425	TIE NYLON CABLE 100X2.5MM	2.	

Part Number: 2A0305 Date : 17/07/94
Description : PCB ASSY:MX2500 ENERGIZER Page 1 of 1

Part	Description	Qty	Cct-Ref
2A3053	INDUCTOR: 80UH,BROWN	1.	Ll
2A3054	INDUCTOR: 2MH,WHITE	1.	L2
2A4412-1	PCB: MX ENERGIZER VER 1	1.	
2B0000	RESISTOR ZERO OHM LINK	6.	LN1-6
2B1097	RESISTOR: IOK,MF,0,25W,5%	2.	R10-11
2B1105A	RESISTOR: 22K,MF,0.25W,1%	1.	R9
2B1145	RESISTOR: IM,MF,0.25W,5%	1.	R14
2B1549	RESISTOR: lM5,MF,0.5W,5%,HVT	3.	R4-5,8
2B1945	RESISTOR: 4M7,MF,lW,1%,HVT	1.	R3
2B2462	RESISTOR: 33,WW,5W,10%	1.	R2
2B2635	RESISTOR: 2.7,WW,10W	1.	R1
2B2649	RESISTOR: IO,WW,10W	2.	R6-7
2B4004	VDR: MEOX,550V	1.	R15
2C0438	CAP: 330N,25OV,MKT,10%	1.	CI
2C0443	CAP: 2200U,16V,PCE	2.	C3-4
2C0468	CAP: 4U,250VAC,MKT,,MATSUSH	2.	C2,9
2C0505	CAP: 6U,90OV,MKP,10%	3.	C5-7
2C0530	CAP: 6U,1200V,120A,MKP,10%	1.	C8
2D0504	DIODE: AV,lKV,1.5A	3.	DI-2,13
2D0544	DIODE: SQ75NV	2.	D14,16
2D0560	DIODE: SR,IKV,3A	6.	D4-6,9-10,17
2D0591	DIODE:ZE, 15V, 5W	1.	D3
2F0648	TRIAC 800V 12AMP	1.	Q2
2F0657	SCR 1000V 40A ITSM 500A	2.	Q5-6
2G0769	REGULATOR 7805 5V 1.5A	1.	(11
2K1509	WIRESET:12 WAY RIBBON,60 MM	1.	ji
4E4338	FASTON RECEPTACLE 6.3MM	6.	
4G4425	TIE NYLON CABLE 100X2.5MM	2.	

Part Number: 2A0287 Date : 17/07/94
Description : PCB ASSY: REMOTE CONTROL Page 1 of 1

Part	Description	Qty	Cct-Ref
2A2186	XFMR ASSY: INV,85qOOVEFD20	1.	T1
2A2188	XFMR ASSY: O/P, 16:75,EFD25	1.	T2
2A4414-1	PCB: G306 REMOTE VER 1	1.	
2A8001	SOFTWARE-ASSY: REMOTE CONTROL	1.	U1
2B1064	RESISTOR: 470,MF,0.25W,5%	1.	R2
2131081A	RESISTOR: 2K2,MF,0.25W,I%	1.	R18
2B1097	RESISTOR: 10K,MF,0.25W,5%	6.	R1,3,814-15,19
2B1107	RESISTOR: 27K,MF,0.25W,5%	1.	R6
2B1113	RESISTOR: 47K,MF,0.25W,5%	2.	R10,16
2B1121	RESISTOR: 100K,MF,0.25W,I%	1.	R4
2B1137	RESISTOR: 470K,MF,0.25W,5%	1.	R9
2B1139	RESISTOR: 560K,MF,0.25W,5%	1.	R17
2B1149	RESISTOR: 1M5,MF,0.25W,5%	1.	R5
2B1249	RESISTOR: 100,MF,0.5W,5%	1.	R7
2B1495	RESISTOR: 8K2,0.5W,5%,MF	1.	R11
2B1913	RESISTOR:47K,MF,,2%,HVT	2.	R12-13
2C0411	CAP: 100N,50V,CER	4.	Cl-2,4,6
2C0517	CAP: 4N7,100V,CER,5.08MM	1.	C3
2C0522	CAP: 10U,16V,TAN,,PC2.5	3.	C7-9
2C0528	CAP: 330N, 400 VDC, MKP, 10%	1.	C5
2D0501	DIODE: GP,IKV,IA	5.	D3-7
2D0544	DIODE: SG,75V	1.	D1
2D0553	DIODE: ST,3KV,500MA	6.	D8-13
2D5001	LED: RED 3MM DIFFUSED	1.	D2
2E0605	TRN: SS,P	2.	Q3,7
2E0608	TRANSISTOR NPN SMALL SIGNAL	3.	Q1-2,6
2E0620	TRANS MOSFET N-CH 60V 500MA	1.	Q4
2F0691	SCR: 800V,1.25A,ITSM=25A,TO-92	1.	Q5
2G0764	REG: 5V,TO-92,5%,3UA	1.	U3
2G0782	IC: TIMER 555,CMOS	1.	U2
2K0880	AIRESET BATTERY,9V,12 STRAND	1.	XL1
2M1123	CERAMIC RESONATOR 4MHZ	1.	EM1
2M1162	FTLTER:EMI SUPPRESSION LC TYPE	1.	SW1
2M1178	SWITCH: 2WAY DIP,SPST	1.	J1
4E4348	TERMINAL:2 WAY,ZIF,VERT,O. 1"	1.	
6G5486	CONTACT, FENCE SPRING, BRASS	1.	

Part Number: G413R
Description : REMOTE CONTROL: MX SERIES

Date : 17/07/94
Page 1 of 1

Part	Description	Qty	Cct-Ref
2A0287	PCB ASSY : REMOTE CONTROL	1.	
2A1262	WIRE ASSY: MXRl EARTH	1.	
2M1055	BATTERY 9V N0216	1.	
2M1175	SWITCH: MEMBRANE,MXRl	1.	SW1
2N1231	COVER: UPPER MXRl	1.	
2N1232	COVER: LOWER MXR1	1.	
2N1233	CLIP: MXRl	1.	
5D2719	SCRE'W,8GX1/2",PAN,POZI,TYPE 25	2.	
6G5487	CONTACT, FENCE STUD, BRASS	1.	

Part Number: 2A0301
Description : PCB ASSY : MX O/P MOD

Date : 17/07/94
Page 1 of 1

Part	Description	Qty	Cct-Ref
2A4420-1	PCB: O/P MOD, VER 1	1.	
2B0000	RESISTOR ZERO OHM LINK	3.	LN502-504
2B2713	RESISTOR: 4K7, WW, 10W	2.	R500-501
2M1154	PCB SPACER KGTS-12T	1.	
2M1155	PCB SPACER KGTS-10T	2.	
4E4225	TERMINAL FUSEHOLDER SPECIAL	18.	
4E4266	FASTON TAB :6.3MM R/ANGLE PCB	3.	

Part Number: G313-1 Date : 17/07/94
Description : ENERGIZER:MX5000 NZ/AUST Page 1 of 2

Part	Description	Qty	Cct-Ref
G313-1	ENERGIZER:MX5000 NZ/AUST		
2A0288	PCB ASSY: MX5000 CONTROL	1.	
2A0290	PCB ASSY:MX5000 ENERGIZER	1.	
2A0291	PCB ASSY: MX MEAS CAP,2MM	1.	
2A0300	PCB ASSY: MX5000 CAP CONN	1:	
2A0301	PCB ASSY: MX O/P MOD	1.	
2A1085	WIRE ASSY: 2XQC,BLUE,0.4M	1.	
2A1086	WIRE ASSY:QC,QCTAB,GRN;0.245M	1.	
2A1087	WIRE ASSY:QC,QCTAB,BLACK,0.2M	1.	
2A1088	WIRE ASSY: 2XQC,YLW,0.35M	1.	
2A1089	WERE ASSY: 2XQC,BLACK,0.33M	1'.	
2A1090	WIRE ASSY:QC,QCTAB,RED,0.18M	1.	
2A1091	WIRE ASSY:2XQC,RED,0.31M	1.	
2A2106	XFMR ASSY: O/P,SO:SOO,WHT,#43A	2.	T1-2
2A9063	KNOB ASSY: INS. 6MM; BLUE	1.	
2A9066	COVER ASSY:BLACK(PUNCHED)1 HOL	1.	
2A9313	REMOTE CONTROL PACKAGE	1.	
2A9508	KNOB ASSY: INS. NUT 6MM, GREEN	1.	
2A9509	KNOB ASSY: INS. NUT 6MM, RED	1.	
2C0529	CAP: 30U,1200V,384A,MKP,NUT	4.	C9-12
2K0986	POWERCORD 3PIN 2X0.75MM PVC	1.	
2N1037	BASE'I'(ABS) BLACK M4000	1.	
2N1235	LENS (33X40) CLEAR	1.	
3A2087	PACKING M4000 INSERT TOP	1.	
3A2088	PACKING M4000 INSERT BOTTOM	1.	
3A2113	POLYSTYRENE: 310X155XlOMM	2.	
3A2249	CARTON: MASS, G313	1.	
3A2251	CARTON: MASS PLN OUTER,SPK	0.2	
3B2195	LABEL N&A O/S	1.	
3B2207	LABEL FACTORY TEST	1.	
3B3442	LABEL:G313, FRONT	1.	
3B3445	LABEL: MX PLN SPK OUTER	0.2	
3C2397	CARD WARRANTY 2YR GENERAL USE	1.	
3C2533	LEAFLET IMPORTANT INFORMATION	1.	
3D3029	BAG MINI GRIP 62 X 75MM	1.	
4E4207	TERMINAL BRASS OUTPUT	3.	
4E4347	TERMINAL:BLK 6X0.25" QC MASS	1.	
4G4201	LINK: RETURN SIGNAL,SS	1.	
4G4359	CLIP CANOE 9.4 X 11.1MM BLACK	2.	
4G4394	BUSHING STRAIN RELIEF TYPE A	1.	
4G4411	SPACER ALU 10X 4 X 16MM	8.	
4G4420	SPACER ALU 7.1MM	3.	

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Description : ENERGIZER:MX5000 NZ/AUST Page 2 of 2

Description		
4G4425	TEE NYLON CABLE 10OX2.5MM	3.
5B2602	NUT HEX Z/P M4	8.
5B2636	NUT HALF LOCK S/S M6 X 3MM	3.
5C2648	WASHER STAR S/S M6	3.
5C2652	WASHER FLAT S/S M3 X 7	6.
5C2666	WASHER FLAT S/S M6 X 16	3.
5C2667	WASHER FLAT S/S M6 X 19	3.
5C2676	WASHER FLAT S/S M5 X 16	8.
5C2678	WASHER STAR Z/P M4	8.
5D2748	SCREW SET S/S M6 X 30MM	3.
5D2759	SCREW SELF TAPPING TYPE B 3/8"	2.
5D2760	SCREW SELF TAPPING 10 X 25MM	3.
5F2916	RIVET 73 ASL 4-10	3.
6J5790	MANUAL P/FENCE INT-ENG/VERSION	1.
6J7340	MANUAL: SMARTFENCE MX5000/2500	1.

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Part	Description	Qty	Cct-Ref
2A0291	PCB ASSY: MX MEAS CAP,2MM	1.	
2A0301	PCB ASSY: MX O/P MOD	1.	
2A0303	PCB ASSY: MX2500 CAP CONN	1.	
2A0304	PCB ASSY: MX2500 CONTROL	1.	
2A0305	PCB ASSY:MX2500 ENERGIZER	1.	
2A1085	WIRE ASSY: 2XQC,BLUE,0.4M	1.	
2AI086	WIRE ASSY:QC,QCTAB,GRN,0.245M	1.	
2A1087	WIRE ASSY:QC,QCTAB,BLACK,0.2M	1.	
2A1089	WIRE ASSY: 2XQC,BLACK,0.33M	1.	
2A2106	XFMR ASSY: CWT50:500,WHT,#43A	1.	T1
2A9063	KNOB ASSY: INS. 6MM, BLUE	1.	
2A9067	COVER ASSY:GREEN(PUNCHED)l HOL	1.	
2A9313	REMOTE CONTROL PACKAGE	1.	
2A9508	KNOB ASSY: INS. NUT 6MM, GREEN	1.	
2A9509	KNOB ASSY: INS. NUT 6MM, RED	1.	
2C0529	CAP: 30U,1200V,384A,MKP,NUT	2.	C9-10
2K0986	POWERCORD' 3PIN 2XO.75MM PVC	1.	
2N1037	BASET(ABS) BLACK M4000	1.	
2N1235	LENS (33X40) CLEAR	1.	
3A2087	PACKING M4000 INSERT TOP	1.	
3A2088	PACKING M4000 INSERT BOTTOM	1.	
3A2113	POLYSTYRENE: 31OX155XIOMM	2.	
3A2228	CARTON: MASS,G312	1.	
3A2251	CARTON: MASS PLN OUTER,5PK	0.2	
3B2195	LABEL N&A O/S	I .	
3B2207	LABEL FACTORY TEST	1.	
3B3443	LABEL:G312, FRONT	1.	
3B3445	LABEL: MX PLN 5PK OUTER	a2	
3C2397	CARD WARRA,NTY2YR GENERAL USE	1.	
3C2533	LEAFLET IMPORTANT INFORMATION	1.	
3D3029	BAG MINI GRIP 62 X 75MM	1.	
4E4207	TERMINAL BRASS OUTPUT	3.	
4E4347	TERMINAL:BLK 6XO.25" QC MASS	1.	
4G4201	LINK: RETURN SIGNAL,SS	1.	
4G4359	CLIP CANOE 9.4 X 11. 1 MM BLACK	2.	
4G4394	BUSHING STRAIN RELIEF TYPE A	1.	
4G4411	SPACER ALU 1OX 4 X 16MM	4.	
4G4420	SPACER ALU 7. 1MM	3.	
4G4425	TEE NYLON CABLE 10OX2.5MM	3.	
5B2602	NUT HEX ZIP M4	4.	
5B2636	NUT HALF LOCK S/S M6 X 3MNM	3.	
5C2648	WASHER STAR S/S M6	3.	

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Part	Description	Qty	Cct-Ref
5C2652	WASHER FLAT S/S M3 X 7	6.	
5C2666	WASHER FLAT S/S M6 X 16	3.	
5C2667	WASHER FLAT S/S M6 X 19	3.	
5C2676	WASHER FLAT S/S M5 X 16	10.	
5C2678	WASHER STAR Z/P M4	4.	
5D2748	SCREW SET S/S M6 X 30MM	3.	
5D2759	SCREW SELF TAPPING TYPE B 3/8"	2.	
5D2760	SCREW SELF TAPPING 10 X 25MM	3.	
5F2916	RIVET 73 ASL 4- 10	3.	
6J5790	MANUAL P/FENCE INT-ENGNERSION	1.	
6J7340	MANUAL:SMARTFENCE MX5000/2500	1.	