



# CONSUMER SERVICES TECHNICAL EDUCATION GROUP PRESENTS

# G-22

## UNDERSTANDING TECH SHEETS

**⚠ WARNING**

Disconnect power before servicing.  
Replace all parts and panels before operating.  
Failure to do so can result in death or electrical shock.

**⚠ AVERTISSEMENT**

Risque de choc électrique.  
Déconnecter la source de courant électrique avant l'intervention.  
Remplacer pièces et panneaux avant de faire la remise en marche.  
A la non respect de ces instructions peut causer un décès ou un choc électrique.

**Electrostatic Discharge (ESD)**  
Sensitive Electronics

ESD problems are present everywhere. ESD may damage or weaken the electronic board. The new board may appear to work well after repair is finished, but failure may occur at a later date due to ESD stress.

- Use an anti-static wrist strap. Connect wrist strap to ground connection point or ungrounded metal in the appliance.
- Touch your finger repeatedly to a ground connection point or ungrounded metal in the appliance.
- Before removing the part from its package, touch the anti-static bag to a ground connection point or ungrounded metal in the appliance.
- Avoid touching electronic parts or terminal contacts, handle electronic board by edges only.
- When repackaging failed electronic board in anti-static bag, observe above instructions.

**Circuits électroniques sensibles aux décharges électrostatiques**

Les problèmes de décharges électrostatiques sont présents partout. Ces décharges peuvent endommager ou affaiblir l'ensemble de commande électronique. Le nouvel ensemble de commande peut sembler bien fonctionner après la réparation, mais il peut se révéler défectueux par la suite, à cause de la contamination due aux décharges électrostatiques.

- Porter un bracelet antistatique. Raccorder le bracelet à la connexion de masse verte ou à une partie métallique non peinte de la machine.
- Toucher plusieurs fois du bout du doigt une connexion de masse verte ou une partie métallique non peinte de la machine.
- Avant de sortir la pièce de son emballage, agripper le sac antistatique ou une connexion de masse verte ou une partie métallique non peinte de la machine.
- Eviter de toucher les pièces électroniques ou les contacts des bornes, ne manipuler l'ensemble de commande électronique que par ses bords.
- Quand on place l'ensemble de commande électronique défectueux dans le sac antistatique, respecter les instructions ci-dessus.

**MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING CANADIAN PATENTS:**

4,873,441	5,203,252	5,406,750	5,395,194
4,873,442	5,203,253	5,406,751	5,395,195
4,799,227	5,163,433	5,163,434	5,274,238
4,799,228	5,163,435	5,163,436	5,274,239
4,799,229	5,163,437	5,163,438	5,274,240
4,807,223	5,163,439	5,163,440	5,274,241
5,178,999	5,163,441	5,163,442	5,274,242
5,178,999	5,163,443	5,163,444	5,274,243
5,178,999	5,163,445	5,163,446	5,274,244
5,178,999	5,163,447	5,163,448	5,274,245
5,178,999	5,163,449	5,163,450	5,274,246
5,178,999	5,163,451	5,163,452	5,274,247
5,178,999	5,163,453	5,163,454	5,274,248
5,178,999	5,163,455	5,163,456	5,274,249
5,178,999	5,163,457	5,163,458	5,274,250
5,178,999	5,163,459	5,163,460	5,274,251
5,178,999	5,163,461	5,163,462	5,274,252
5,178,999	5,163,463	5,163,464	5,274,253
5,178,999	5,163,465	5,163,466	5,274,254
5,178,999	5,163,467	5,163,468	5,274,255
5,178,999	5,163,469	5,163,470	5,274,256
5,178,999	5,163,471	5,163,472	5,274,257
5,178,999	5,163,473	5,163,474	5,274,258
5,178,999	5,163,475	5,163,476	5,274,259
5,178,999	5,163,477	5,163,478	5,274,260
5,178,999	5,163,479	5,163,480	5,274,261
5,178,999	5,163,481	5,163,482	5,274,262
5,178,999	5,163,483	5,163,484	5,274,263
5,178,999	5,163,485	5,163,486	5,274,264
5,178,999	5,163,487	5,163,488	5,274,265
5,178,999	5,163,489	5,163,490	5,274,266
5,178,999	5,163,491	5,163,492	5,274,267
5,178,999	5,163,493	5,163,494	5,274,268
5,178,999	5,163,495	5,163,496	5,274,269
5,178,999	5,163,497	5,163,498	5,274,270
5,178,999	5,163,499	5,163,500	5,274,271
5,178,999	5,163,501	5,163,502	5,274,272
5,178,999	5,163,503	5,163,504	5,274,273
5,178,999	5,163,505	5,163,506	5,274,274
5,178,999	5,163,507	5,163,508	5,274,275
5,178,999	5,163,509	5,163,510	5,274,276
5,178,999	5,163,511	5,163,512	5,274,277
5,178,999	5,163,513	5,163,514	5,274,278
5,178,999	5,163,515	5,163,516	5,274,279
5,178,999	5,163,517	5,163,518	5,274,280
5,178,999	5,163,519	5,163,520	5,274,281
5,178,999	5,163,521	5,163,522	5,274,282
5,178,999	5,163,523	5,163,524	5,274,283
5,178,999	5,163,525	5,163,526	5,274,284
5,178,999	5,163,527	5,163,528	5,274,285
5,178,999	5,163,529	5,163,530	5,274,286
5,178,999	5,163,531	5,163,532	5,274,287
5,178,999	5,163,533	5,163,534	5,274,288
5,178,999	5,163,535	5,163,536	5,274,289
5,178,999	5,163,537	5,163,538	5,274,290
5,178,999	5,163,539	5,163,540	5,274,291
5,178,999	5,163,541	5,163,542	5,274,292
5,178,999	5,163,543	5,163,544	5,274,293
5,178,999	5,163,545	5,163,546	5,274,294
5,178,999	5,163,547	5,163,548	5,274,295
5,178,999	5,163,549	5,163,550	5,274,296
5,178,999	5,163,551	5,163,552	5,274,297
5,178,999	5,163,553	5,163,554	5,274,298
5,178,999	5,163,555	5,163,556	5,274,299
5,178,999	5,163,557	5,163,558	5,274,300
5,178,999	5,163,559	5,163,560	5,274,301
5,178,999	5,163,561	5,163,562	5,274,302
5,178,999	5,163,563	5,163,564	5,274,303
5,178,999	5,163,565	5,163,566	5,274,304
5,178,999	5,163,567	5,163,568	5,274,305
5,178,999	5,163,569	5,163,570	5,274,306
5,178,999	5,163,571	5,163,572	5,274,307
5,178,999	5,163,573	5,163,574	5,274,308
5,178,999	5,163,575	5,163,576	5,274,309
5,178,999	5,163,577	5,163,578	5,274,310
5,178,999	5,163,579	5,163,580	5,274,311
5,178,999	5,163,581	5,163,582	5,274,312
5,178,999	5,163,583	5,163,584	5,274,313
5,178,999	5,163,585	5,163,586	5,274,314
5,178,999	5,163,587	5,163,588	5,274,315
5,178,999	5,163,589	5,163,590	5,274,316
5,178,999	5,163,591	5,163,592	5,274,317
5,178,999	5,163,593	5,163,594	5,274,318
5,178,999	5,163,595	5,163,596	5,274,319
5,178,999	5,163,597	5,163,598	5,274,320
5,178,999	5,163,599	5,163,600	5,274,321
5,178,999	5,163,601	5,163,602	5,274,322
5,178,999	5,163,603	5,163,604	5,274,323
5,178,999	5,163,605	5,163,606	5,274,324
5,178,999	5,163,607	5,163,608	5,274,325
5,178,999	5,163,609	5,163,610	5,274,326
5,178,999	5,163,611	5,163,612	5,274,327
5,178,999	5,163,613	5,163,614	5,274,328
5,178,999	5,163,615	5,163,616	5,274,329
5,178,999	5,163,617	5,163,618	5,274,330
5,178,999	5,163,619	5,163,620	5,274,331
5,178,999	5,163,621	5,163,622	5,274,332
5,178,999	5,163,623	5,163,624	5,274,333
5,178,999	5,163,625	5,163,626	5,274,334
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5,178,999	5,163,679	5,163,680	5,274,361
5,178,999	5,163,681	5,163,682	5,274,362
5,178,999	5,163,683	5,163,684	5,274,363
5,178,999	5,163,685	5,163,686	5,274,364
5,178,999	5,163,687	5,163,688	5,274,365
5,178,999	5,163,689	5,163,690	5,274,366
5,178,999	5,163,691	5,163,692	5,274,367
5,178,999	5,163,693	5,163,694	5,274,368
5,178,999	5,163,695	5,163,696	5,274,369
5,178,999	5,163,697	5,163,698	5,274,370
5,178,999	5,163,699	5,163,700	5,274,371
5,178,999	5,163,701	5,163,702	5,274,372
5,178,999	5,163,703	5,163,704	5,274,373
5,178,999	5,163,705	5,163,706	5,274,374
5,178,999	5,163,707	5,163,708	5,274,375
5,178,999	5,163,709	5,163,710	5,274,376
5,178,999	5,163,711	5,163,712	5,274,377
5,178,999	5,163,713	5,163,714	5,274,378
5,178,999	5,163,715	5,163,716	5,274,379
5,178,999	5,163,717	5,163,718	5,274,380
5,178,999	5,163,719	5,163,720	5,274,381
5,178,999	5,163,721	5,163,722	5,274,382
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5,178,999	5,163,749	5,163,750	5,274,396
5,178,999	5,163,751	5,163,752	5,274,397
5,178,999	5,163,753	5,163,754	5,274,398
5,178,999	5,163,755	5,163,756	5,274,399
5,178,999	5,163,757	5,163,758	5,274,400
5,178,999	5,163,759	5,163,760	5,274,401
5,178,999	5,163,761	5,163,762	5,274,402
5,178,999	5,163,763	5,163,764	5,274,403
5,178,999	5,163,765	5,163,766	5,274,404
5,178,999	5,163,767	5,163,768	5,274,405
5,178,999	5,163,769	5,163,770	5,274,406
5,178,999	5,163,771	5,163,772	5,274,407
5,178,999	5,163,773	5,163,774	5,274,408
5,178,999	5,163,775	5,163,776	5,274,409
5,178,999	5,163,777	5,163,778	5,274,410
5,178,999	5,163,779	5,163,780	5,274,411
5,178,999	5,163,781	5,163,782	5,274,412
5,178,999	5,163,783	5,163,784	5,274,413
5,178,999	5,163,785	5,163,786	5,274,414
5,178,999	5,163,787	5,163,788	5,274,415
5,178,999	5,163,789	5,163,790	5,274,416
5,178,999	5,163,791	5,163,792	5,274,417
5,178,999	5,163,793	5,163,794	5,274,418
5,178,999	5,163,795	5,163,796	5,274,419
5,178,999	5,163,797	5,163,798	5,274,420
5,178,999	5,163,799	5,163,800	5,274,421
5,178,999	5,163,801	5,163,802	5,274,422
5,178,999	5,163,803	5,163,804	5,274,423
5,178,999	5,163,805	5,163,806	5,274,424
5,178,999	5,163,807	5,163,808	5,274,425
5,178,999	5,163,809	5,163,810	5,274,426
5,178,999	5,163,811	5,163,812	5,274,427
5,178,999	5,163,813		

# TABLE OF CONTENTS

	Page
Introduction . . . . .	1
Esterline Charts . . . . .	2
Logic Charts . . . . .	10
Tracing Diagrams . . . . .	12
Component Testing . . . . .	15
Electronic Controls . . . . .	16
Sample Exercise . . . . .	17
Practice Exercises . . . . .	20
Additional Diagram/Chart . . . . .	24

# INTRODUCTION

The goal of this Job Aid is to assist the IHSP, or IHSP trainer, in understanding the types of technical information that is contained in tech sheets.

This Job Aid will focus on the following portions of the tech sheet:

- Esterline Charts
- Logic Charts
- Wiring Diagrams
  - Components
  - Symbols
  - Tracing
- Strip Circuits
- Component Testing
- Diagnostic Charts

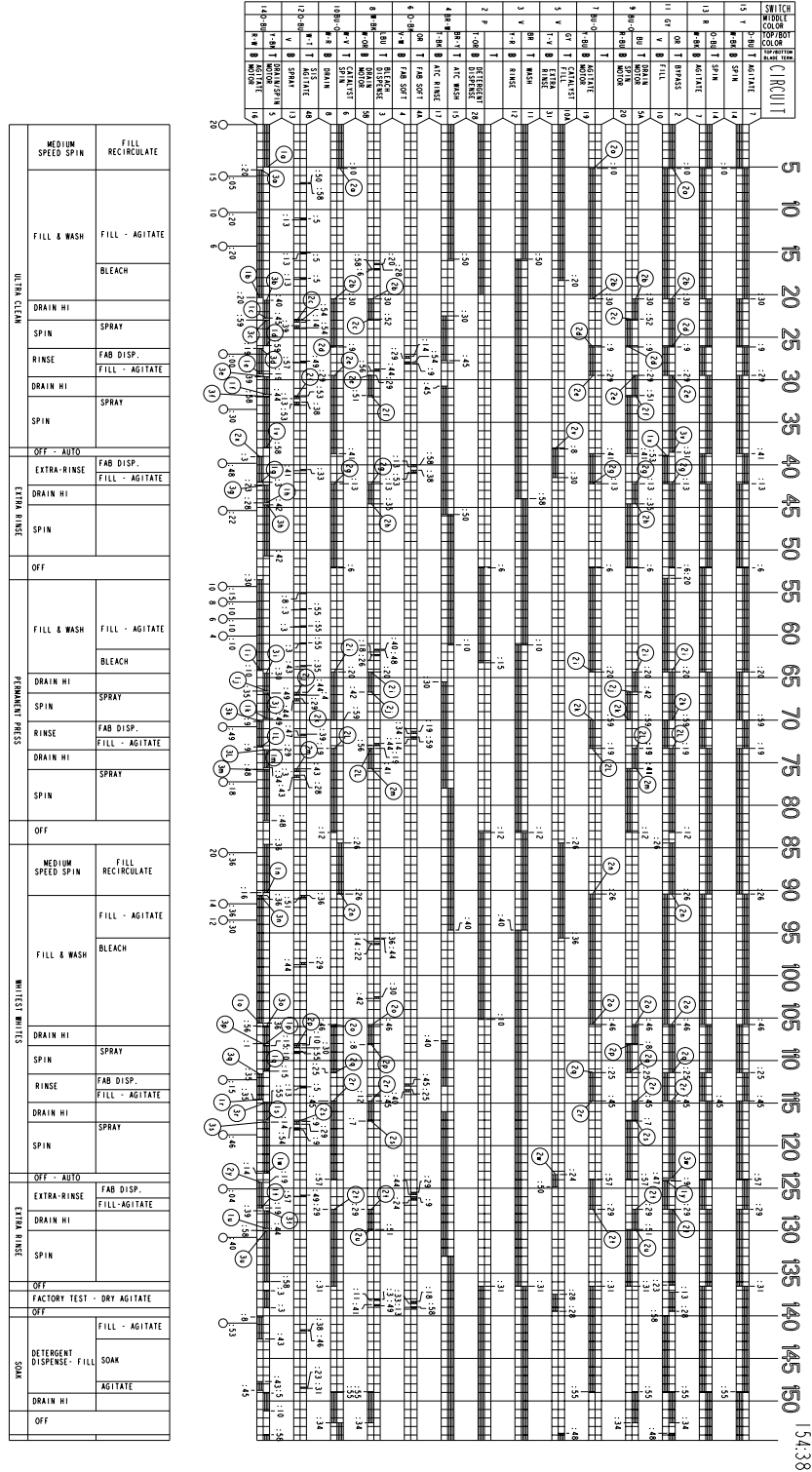
The exercises and questions will aid in reinforcing what has been learned.

# ESTERLINE CHARTS

## Chart 1

The first key to unlocking the mysteries of the Esterline chart is to understand what information is found on the chart. Some of the items on the charts are used by engineers and manufacturing.

The most important functions of the tech sheet will be covered to help the IHSP in troubleshooting.



## Chart 2

SWITCH	MIDDLE COLOR	TOP/BOT COLOR	TOP/BOT BLADE TERM.	CIRCUIT	
15	Y	O-BU	T	AGITATE	7
		W-BK	B	SPIN	14
13	R	O-BU	T	SPIN	14
		W-BK	B	AGITATE	7
11	GY	OR	T	BYPASS	2
		V	B	FILL	10
9	BU-O	BU	T	DRAIN MOTOR	5A
		R-BU	B	SPIN MOTOR	20
7	BU-O	Y-BU	B	AGITATE MOTOR	19
5	V	GY	T	CATALYST FILL	10A
		T-V	B	EXTRA RINSE	31
3	V	BR	T	WASH	11
		Y-R	B	RINSE	12
2	P	T-OR	B	DETERGENT DISPENSE	28
4	BR-W	BR-Y	T	ATC WASH	15
		T-BK	B	ATC RINSE	17
6	O-B	OR	T	FAB SOFT	4A
		V-W	B	FAB SOFT	4
8	W-BK	LBU	T	BLEACH DISPENSE	3
		W-OR	B	DRAIN MOTOR	5B
10	BU-O	W-V	T	CATALYST SPIN	6
		W-R	B	DRAIN	8
12	O-BU	W-T	T	SIS AGITATE	48
		V	B	SPRAY	13
14	O-BU	Y-BK	T	DRAIN/SPIN MOTOR	5
		R-W	B	AGITATE MOTOR	16

### Terminal Code Or Wire Color Code

Indicates the color of the wire that is connected to the timer and goes to the component that performs the function indicated.

A solid colored wire will be designated with a single or two letter code.

For example:

- V is a violet wire
- GY is a gray wire

A wire may have a specific color with a "tracer" line on the wire. These will be designated by two sets of letters divided by a dash "-".

For example:

- T - OR is a tan wire with an orange stripe.

## Chart 3

SWITCH	MIDDLE COLOR	TOP/BOT COLOR	TOP/BOTTOM BLADE TERM.	CIRCUIT	
15	Y	O-BU	T	AGITATE	7
		W-BK	B	SPIN	14
13	R	O-BU	T	SPIN	14
		W-BK	B	AGITATE	7
11	GY	OR	T	BYPASS	2
		V	B	FILL	10
9	BU-O	BU	T	DRAIN MOTOR	5A
		R-BU	B	SPIN MOTOR	20
7	BU-O		T		
		Y-BU	B	AGITATE MOTOR	19
5	V	GY	T	CATALYST FILL	10A
		T-V	B	EXTRA RINSE	31
3	V	BR	T	WASH	11
		Y-R	B	RINSE	12
2	P		T		
		T-OR	B	DETERGENT DISPENSE	28
4	BR-W	BR-Y	T	ATC WASH	15
		T-BK	B	ATC RINSE	17
6	O-BK	OR	T	FAB SOFT	4A
		V-W	B	FAB SOFT	4
8	W-BK	LBU	T	BLEACH DISPENSE	3
		W-OR	B	DRAIN MOTOR	5B
10	BU-O	W-V	T	CATALYST SPIN	6
		W-R	B	DRAIN	8
12	O-BU	W-T	T	SIS AGITATE	48
		V	B	SPRAY	13
14	O-BU	Y-BK	T	DRAIN/SPIN MOTOR	5
		R-W	B	AGITATE MOTOR	16

### Timer Switch Function

This column indicates the function of the timer contact (switch).

It may be written to describe the function that is performed when a particular contact is closed.

It may be used to describe the actual load that is used in conjunction with that particular timer contact.

## Chart 4

SWITCH	MIDDLE COLOR	TOP/BOT COLOR	TOP/BOTTOM BLADE TERM.	CIRCUIT	
15	Y	O-BU	T	AGITATE	7
		W-BK	B	SPIN	14
13	R	O-BU	T	SPIN	14
		W-BK	B	AGITATE	7
11	GY	OR	T	BYPASS	2
		V	B	FILL	10
9	BU-O	BU	T	DRAIN MOTOR	5A
		R-BU	B	SPIN MOTOR	20
7	BU-O		T		
		Y-BU	B	AGITATE MOTOR	19
5	V	GY	T	CATALYST FILL	10A
		T-V	B	EXTRA RINSE	31
3	V	BR	T	WASH	11
		Y-R	B	RINSE	12
2	P		T		
		T-OR	B	DETERGENT DISPENSE	28
4	BR-W	BR-Y	T	ATC WASH	15
		T-BK	B	ATC RINSE	17
6	O-BK	OR	T	FAB SOFT	4A
		V-W	B	FAB SOFT	4
8	W-BK	LBU	T	BLEACH DISPENSE	3
		W-OR	B	DRAIN MOTOR	5B
10	BU-O	W-V	T	CATALYST SPIN	6
		W-R	B	DRAIN	8
12	O-BU	W-T	T	SIS AGITATE	48
		V	B	SPRAY	13
14	O-BU	Y-BK	T	DRAIN/SPIN MOTOR	5
		R-W	B	AGITATE MOTOR	16

### Timer Switch Numbers

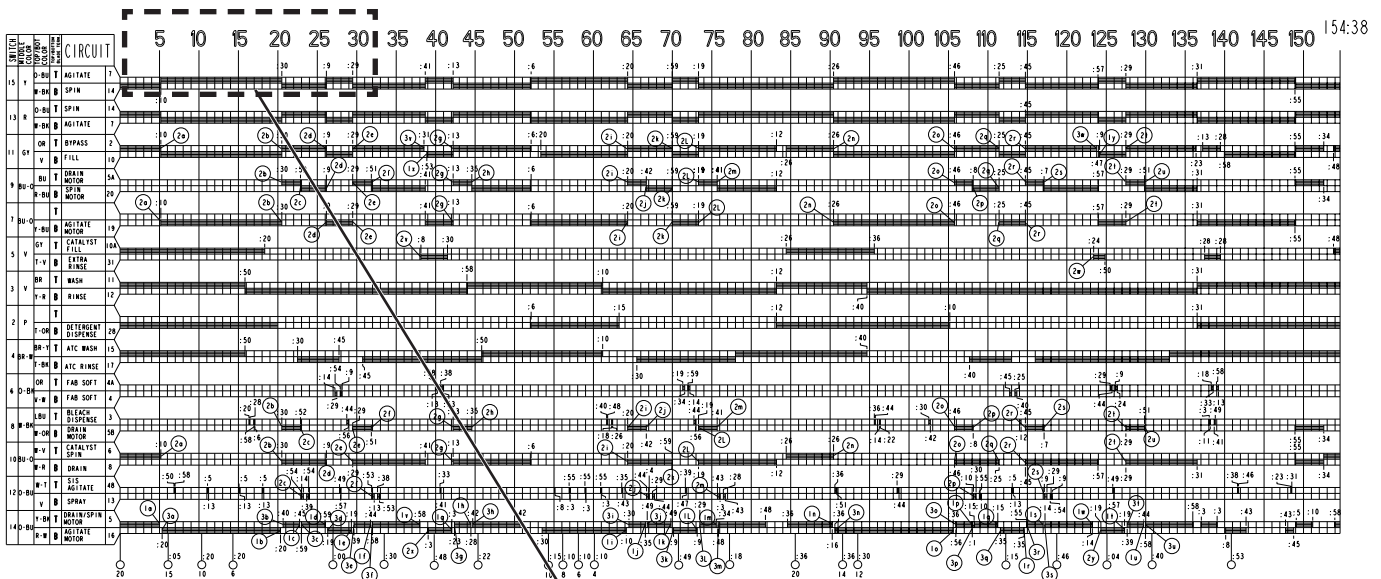
The numbers in this column indicate the timer contact. They correspond to the numbers on the wiring diagram. There is no sequence to these numbers.

## Chart 5

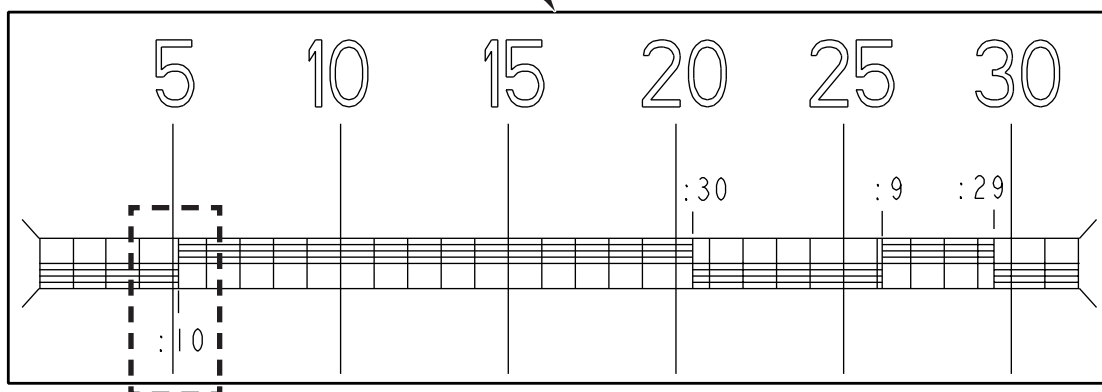
The diagram shows **INTERVALS 0 – 32**, and is interpreted as follows:

- The intervals on this diagram are each 1 minute.
- Some diagrams may represent other increments of time (such as 90 or 120 seconds).

- Use the legend on the tech sheet to determine the timing for the unit you are servicing.
- Special timing intervals are used when a timer contact is closed or opened at a time other than the timing chart increment.
- The “:10” (outlined on the enlarged lower chart) indicates a contact that closes 10 seconds after the interval begins.



UNIT	FUNCTION	INTERVAL	TIME
1	AGITATE	1	0-1
2	SPIN	2	1-2
3	AGITATE	3	2-3
4	SPIN	4	3-4
5	AGITATE	5	4-5
6	SPIN	6	5-6
7	AGITATE	7	6-7
8	SPIN	8	7-8
9	AGITATE	9	8-9
10	SPIN	10	9-10
11	AGITATE	11	10-11
12	SPIN	12	11-12
13	AGITATE	13	12-13
14	SPIN	14	13-14
15	AGITATE	15	14-15
16	SPIN	16	15-16
17	AGITATE	17	16-17
18	SPIN	18	17-18
19	AGITATE	19	18-19
20	SPIN	20	19-20
21	AGITATE	21	20-21
22	SPIN	22	21-22
23	AGITATE	23	22-23
24	SPIN	24	23-24
25	AGITATE	25	24-25
26	SPIN	26	25-26
27	AGITATE	27	26-27
28	SPIN	28	27-28
29	AGITATE	29	28-29
30	SPIN	30	29-30
31	AGITATE	31	30-31
32	SPIN	32	31-32



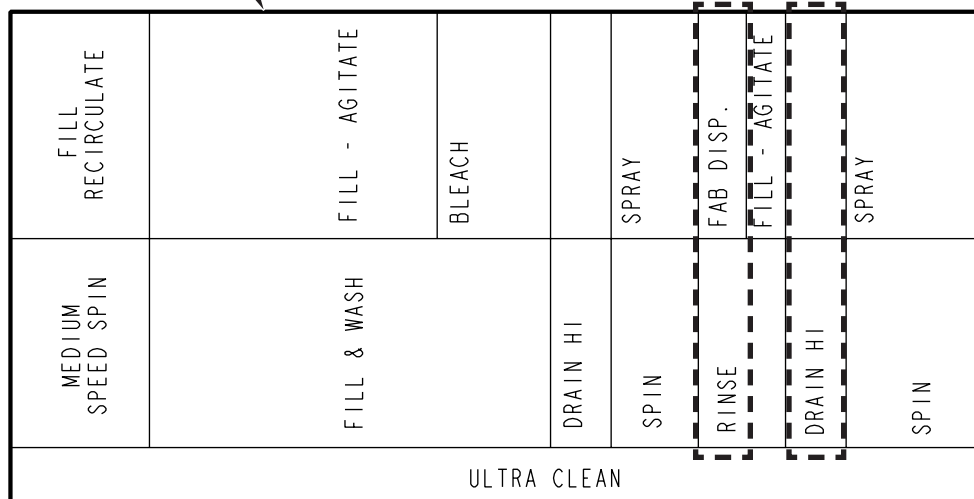
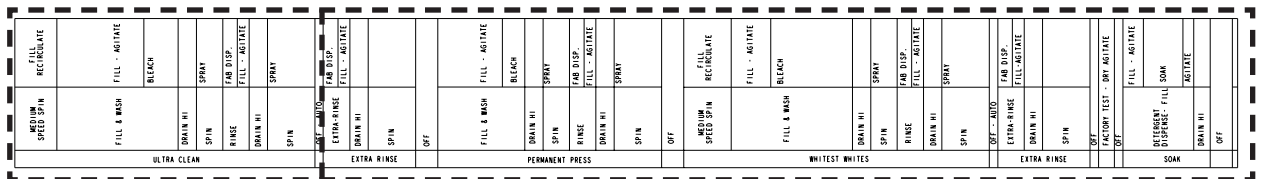
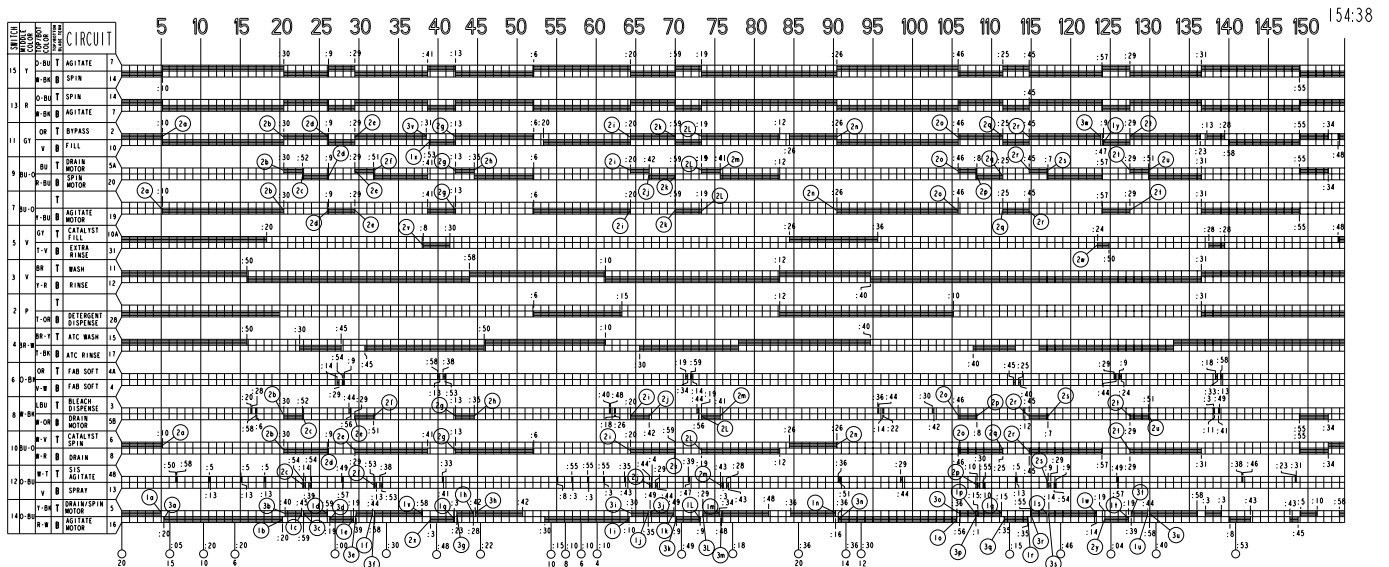


## Chart 6

This outlined portion of the chart indicates which **EVENTS** happen during a given time period. Multiple events may also take place over a given time period.

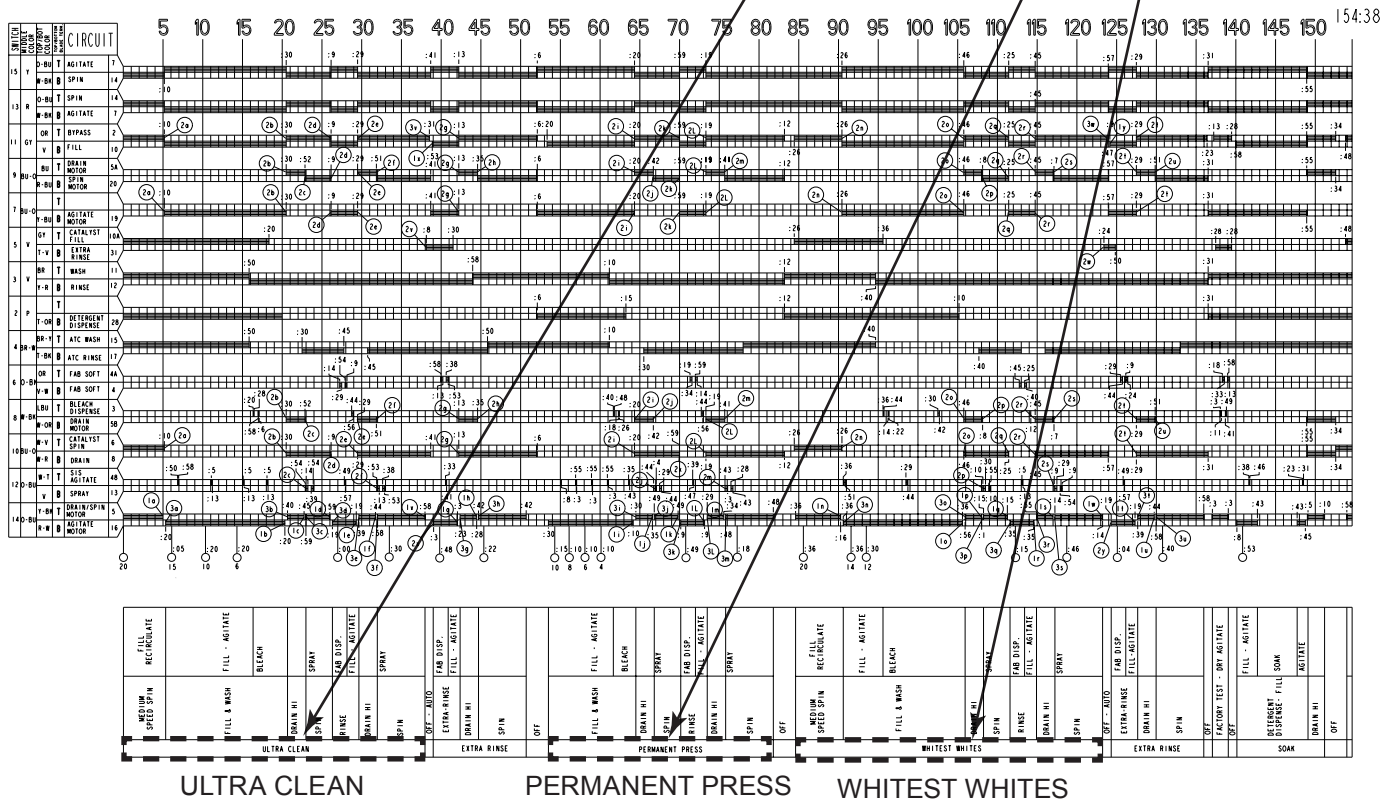
The enlarged chart below shows:

- The “DRAIN HI” is a single event.
- The “FABRIC DISP” event occurs during the “RINSE” event creating a multiple event.



# Chart 7

The dial on the timer corresponds to the **CYCLES** on the Esterline chart.



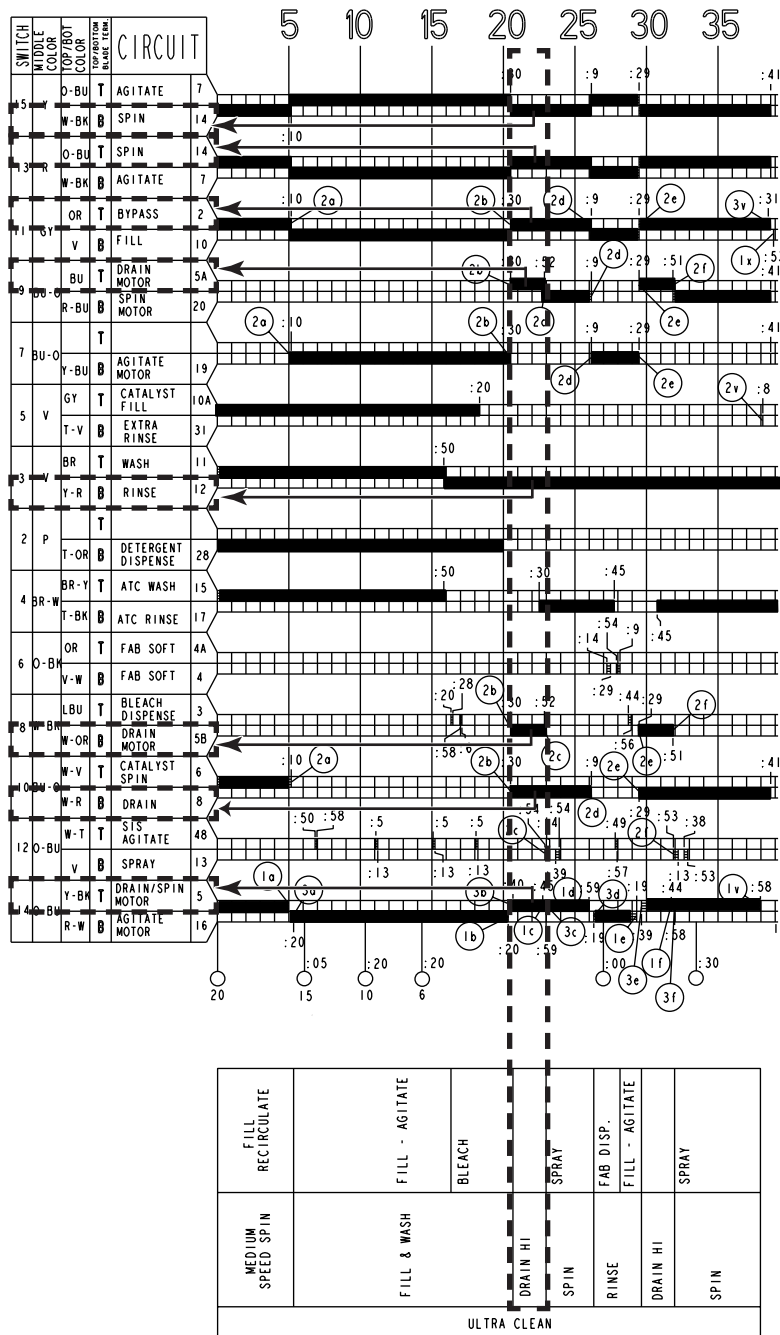
## Chart 8

Use the Esterline chart to troubleshoot a specific problem within the machine. If a problem occurs, for example, during the drain cycle, look at the “event” that uses the drain.

Following the drain event, look for which timer contacts are closed (the closed contacts are represented by the black event lines).

Locate the black line in the drain event, and look at the legend. Note that the timer contact number, function, and wire color are shown.

The timer contact numbers will be used to close corresponding switches on the wiring diagram later.

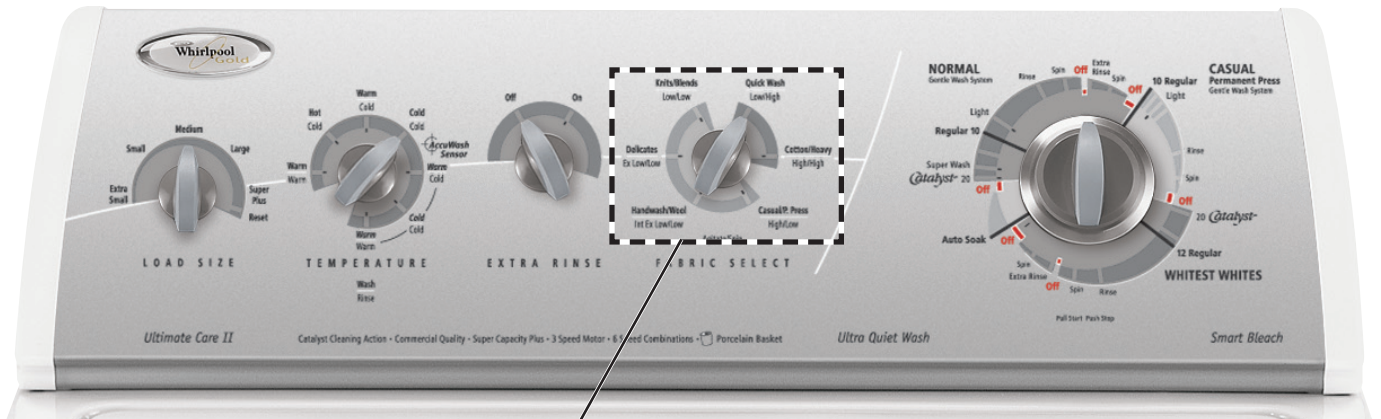


# LOGIC CHARTS

## Chart 1

Logic charts are used to determine when switch contacts, other than the timer contacts, are closed.

These are normally switches the consumer will select, such as water temperature and motor speed (wash, spin).



CONNEXION INTERNE DE COMPOSANT  
CONNEXION INTERNO DEL COMPONENTE  
HARNESS WIRING  
FAISCEAU DE FILS  
CABLEADO DEL HARNESS  
HARNESS CONNECTION  
CONNEXION DE FILS  
CONNEXION DEL HARNESS  
● TERMINAL CONNECTION  
CONNEXION DE LA BORNE  
TERMINAL CONNECTION

WASH RINSE / RINCAGE DE LAVAGE  
/ ACLARACION DE LA COLADA  
DRIVE MOTOR / MOTEUR / IMPULSOR MOTOR  
L LOW / LENT / BAJO  
M MEDIUM / SUPPORT / MEDIA  
H HIGH / HAUT / ALTO  
S START / DEMARRENT / EMPIEZAN

H HOT VALVE  
SOUPAPE D'EAU CHAUDE  
CALIENTE VALVULA

C COLD VALVE  
SOUPAPE D'EAU FROIDE  
FRIA VALVULA

BL BLEACH  
BLANCHIMENT  
BLANQUEO

OB OFF BALANCE  
DESEQUILIBRE  
FUERA DE BALANCE

DRAIN  
VIDANGE  
DRENAJAE

INTERRUPTEUR DE PRESION DEL RECIRCULATE  
FULL / PLEIN / POR COMPLETO

EMPTY / VIDE / VACIO

LID SWITCH  
INTERRUPTEUR DU COUVERCLE  
INTERRUPTEUR DE LA TAPA

TIMER MOTOR  
MOTEUR DE LA MINUTERIE  
MOTOR DEL TEMPORIZADOR

CENTRIFUGAL SWITCH  
CONTACTEUR CENTRIFUGE  
CENTRIFUGO INTERRUPTOR

CABINET GROUND  
TERRE DU CHASSI  
CABIN MOLIDA

CA CAPACITOR / CONDENSATEUR /  
CONDENSADOR

FAB FABRIC SOFTENER  
RAMOLLISSANT DE TISSU  
SUAVIZADOR DE LA TELA

FILL  
REMPLISSEMENT  
LLENAR

DET  
DETERGENT  
DETERGENTE

ATC SENSOR / CAPTEUR D'ATC / SENSOR DEL ATC  
ATC BOARD / PANNEAU D'ATC / TARJETA DEL ATC  
DTC RELAY / RELAIS DE DTC / RELAIS DEL DTC

TSC TEMPERATURE SWITCH CHART  
DIAGRAMME DE COMMUTATEUR DE LA TEMPERATURE  
CARTA DE INTERRUPTOR DE LA TEMPERATURA

FABRIC SELECT MOTOR SPEED SWITCH 3954573 COMMUTATEUR DE VITESSE DE MOTEUR CHOISI DE LA TELA INTERRUPTEUR DE LA VELOCIDAD DEL MOTOR SELECCION DE LA TELA			CLOSED SWITCHES FERME COMMUTATEUR CERRADO INTERRUPTOR							
FABRIC SELECT DIAL CADRAN CHOISI DE LA TELA	MOTOR SPEED VITESSE DE MOTEUR VELOCIDAD DEL MOTOR	SPIN ROTATION VUELTA	S1	S2	S3	S4	S5	S6	S7	S8
INT LOW	INT LOW	SUPPORT								
INT MEDIUM	INT MEDIUM	SUPPORT								
INT HIGH	INT HIGH	SUPPORT								
EXTRA DELICATE	LOW	MEDIUM								
EXTRA SENSIBLE	LOW	MEDIUM								
EXCESS DELICATE	LOW	MEDIUM								
REGULAR	MEDIUM	HIGH								
REGULAR	MEDIUM	HIGH								
REGULAR	MEDIUM	HIGH								
HEAVY DUTY	HIGH	HIGH								
TRES RESISTANT	HIGH	HIGH								
PESADO	HIGH	HIGH								
HANG DRY	HIGH	MEDIUM								
ACCROCHER SEC	HIGH	MEDIUM								
CUELQUE SECO	HIGH	MEDIUM								

MANUFACTURED UNDER ONE OR MORE  
OF THE FOLLOWING US PATENTS:  
4,545,847; 4,555,519; 4,566,295; 4,572,596; 4,610,193;  
4,624,117; 4,633,595; 4,645,455; 4,658,644; 4,664,647;  
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4,715,401; 4,717,876; 4,734,827; 4,738,652;  
4,779,431; 4,782,544; 4,784,666; 4,785,643; 4,792,820;  
4,807,455; 4,809,554; 4,835,991; 4,845,459; 4,856,307;  
4,870,986; 4,880,965; 4,890,465; 4,891,959; 4,898,979;  
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5,432,539; 5,4

## Chart 2

To determine the switches that will be closed, find the selection that has been chosen. The “Regular” and “WC” that are shown below, were selected on the washer console “fabric select” and “water temp” control.

Since a regular Fabric Selection is chosen, follow the “REGULAR” row in the logic chart to a closed switch (designated by an “X”).

Now follow the column with the “X” up, and find the switch that is closed. In this case, the closed switches are S2, S4, S5, and S7.

By doing the same with the other logic switches, the other closed switches A, B, and P2 can also be found.

FABRIC SELECT MOTOR SPEED SWITCH 3954573 COMMUTATEUR DE VITESSE DE MOTEUR CHOISI DE TISSU INTERRUPTOR DE LA VELOCIDAD DEL MOTOR SELECTO DE LA TELA										
FABRIC SELECT DIAL CADRAN CHOISI DE TISSU DIAL SELECTO DE LA TELA	MOTOR SPEED VITESSE DE MOTEUR VELLOCIDAD DEL MOTOR		CLOSED SWITCHS FERME COMMUTATEUR CERRADO INTERRUPTOR							
	AGITATE AGITENT AGITAN	SPIN ROTATION VUELTA	S1	S2	S3	S4	S5	S6	S7	S8
HANDWASH LAVAGE DE MAIN COLADA DE LA MANO	INT LOW INT LENT INT BAJO	MEDIUM SUPPORT MEDIA	X		X					X
EXTRA DELICATE EXTRA SENSIBLE EXCESO DELICADO	LOW LENT BAJO	MEDIUM SUPPORT MEDIA	X		X				X	
DELICATE SENSIBLE DELICADO	MEDIUM SUPPORT MEDIA	MEDIUM SUPPORT MEDIA	X			X	X		X	
REGULAR REGULIER REGULAR	MEDIUM SUPPORT MEDIA	HIGH HAUT ALTO		X		X	X		X	
HEAVY DUTY TRES RESISTANT PESADO	HIGH HAUT ALTO	HIGH HAUT ALTO		X		X		X	X	
HANG DRY ACCROCHER SEC CUELQUE SECO	HIGH HAUT ALTO	MEDIUM SUPPORT MEDIA	X			X		X	X	

OPTION SWITCH CHART 3949180 DIAGRAMME DE COMMUTATEUR D'OPTION CARTA DEL INTERRUPTOR DE LA OPCION		
	P1	P2
ONE RINSE UN RINCAGE UNA ACLARACION		X
EXTRA RINSE RINCAGE DE PLUS ADICIONAL ACLARACION	X	

TSC 3950344		* 65°F±5°F=18°C±2,8°C # 90°F±5°F=32°C±2,8°C				
	WASH RINSE	A	B	C	D	E
1	WW*	X	X		X	
2	HC	X				
3	WC	X	X			
4	CC		X			
5	#WC	X		X		
6	*CC		X			X
7	#WW*	X		X	X	

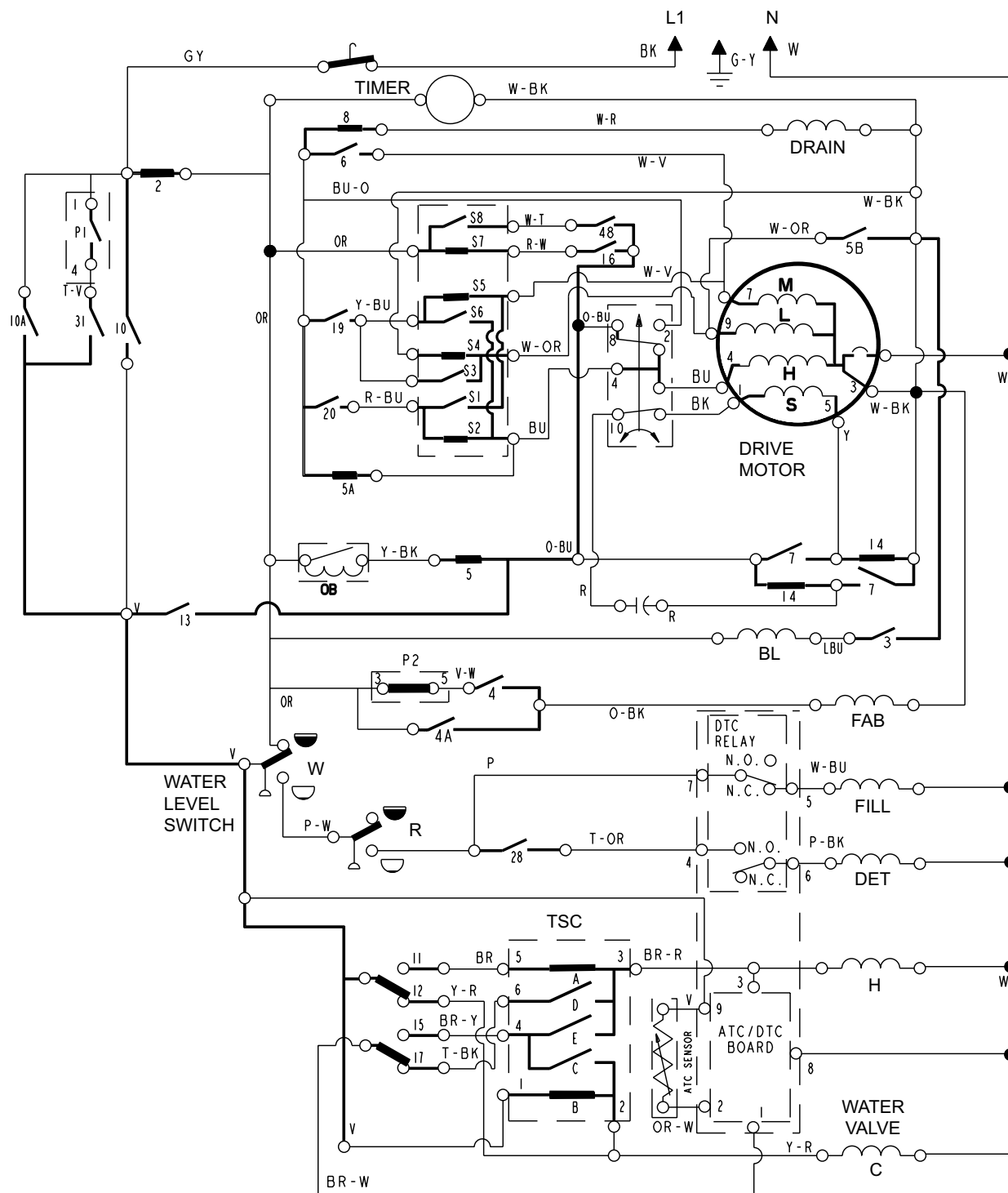


# TRACING DIAGRAMS

## Diagram 1

Since the closed switches and timer contacts for a particular time are now known, this knowledge can be applied to the wiring diagram.

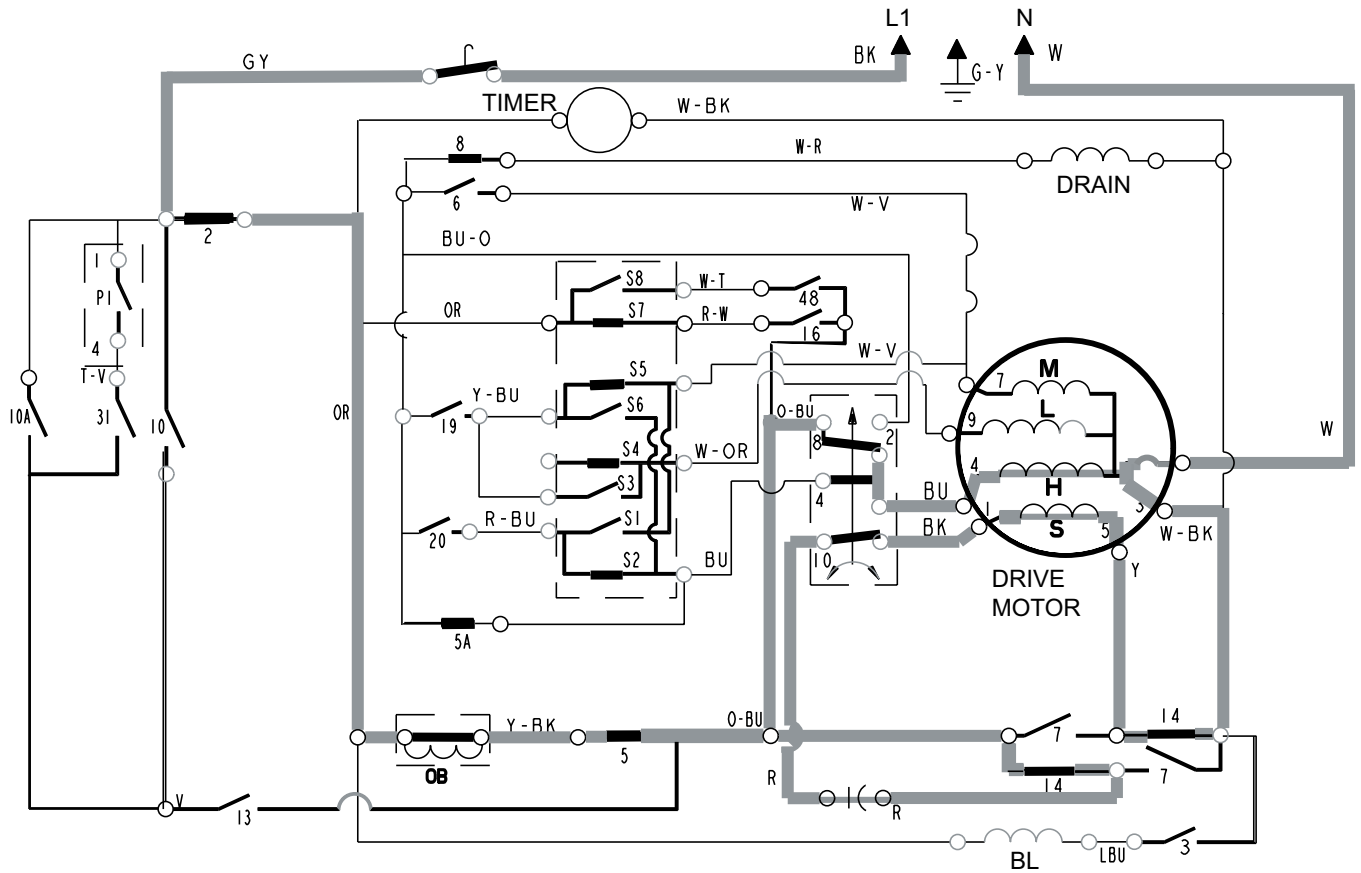
First, close all the switches that are marked on the logic and Esterline charts. This will give a “moment in time” view of the active circuits. Also move the water level switches if the “moment in time” is happening when the tub is full of water.



## Diagram 2

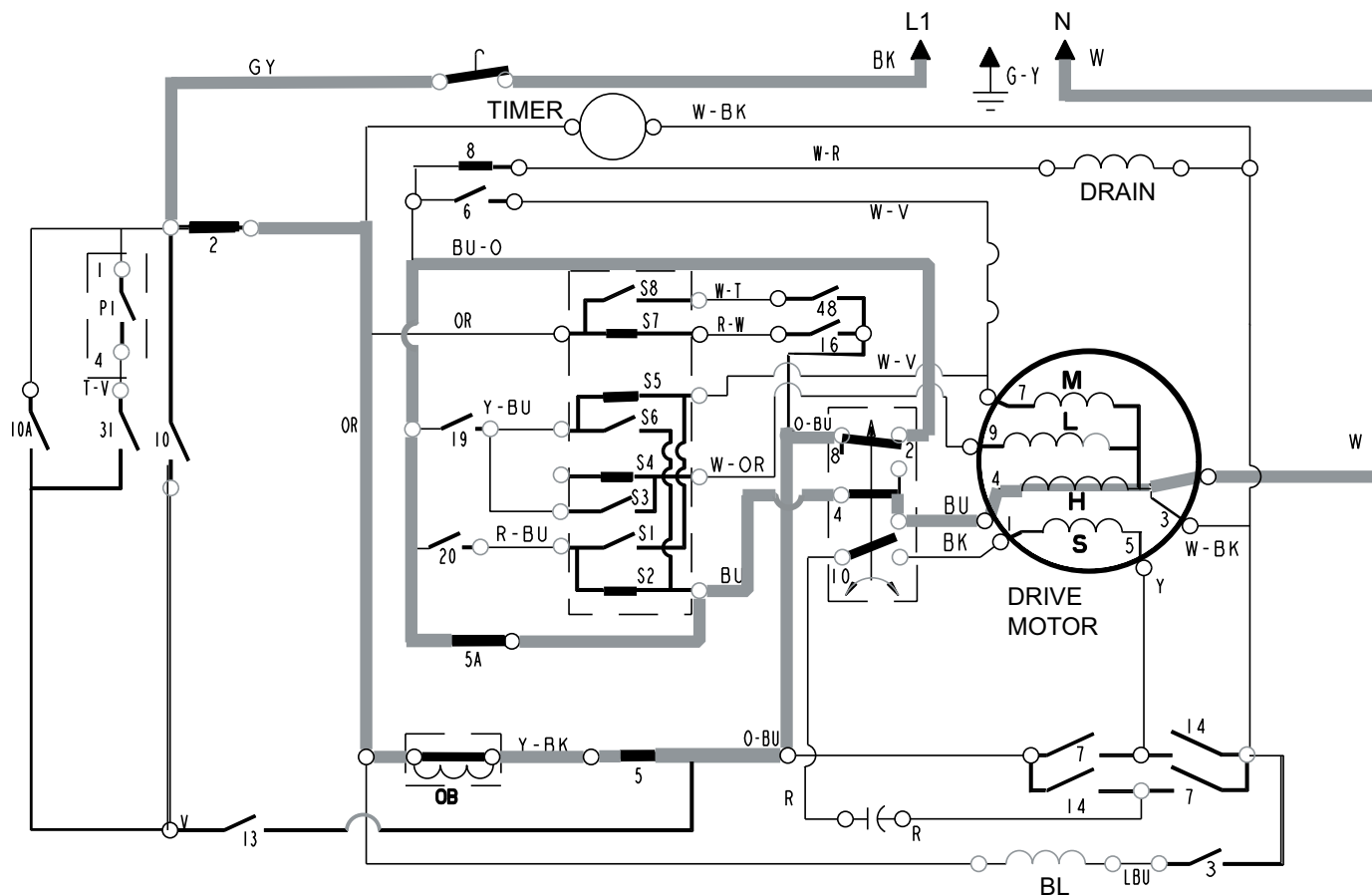
With all the switches closed on the wiring diagram, now trace the active motor circuits at startup.

Active circuits are always traced from source (L1) to source (N).



### Diagram 3

This is the active circuit of the drive motor at full speed.

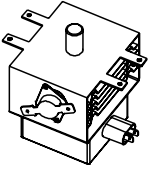
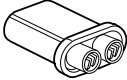

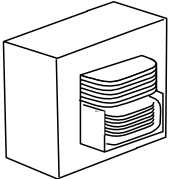
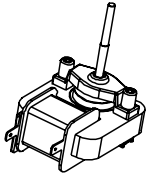
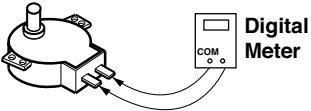




# COMPONENT TESTING

Many tech sheets will have sections describing in detail how to test individual components.

The examples below show how to test the components in a microwave oven.

Components	Test	Results
<b>Magnetron</b> 	<ol style="list-style-type: none"> <li>1. Unplug microwave oven or disconnect power.</li> <li>2. Remove wire leads. Check that the seal is in good condition.</li> <li>3. Measure resistance (ohmmeter scale: Rx1):</li> <li>4. Measure resistance (ohmmeter scale: Rx1k):</li> </ol>	<p>Filament terminal            ■ Normal: Less than 1 ohm</p> <p>Filament to chassis            ■ Normal: Infinite</p>
<b>H.V. Capacitor</b> 	<ol style="list-style-type: none"> <li>1. Unplug microwave oven or disconnect power.</li> <li>2. Discharge capacitor.</li> <li>3. Remove wire leads.</li> <li>4. Measure resistance (ohmmeter scale: Rx1k):</li> </ol>	<p>Terminal to terminal            ■ Normal: Momentarily indicates several ohms, gradually returns to Infinite</p> <p>Terminal to case            ■ Normal: Infinite</p>
<b>H.V. Diode</b> Some inexpensive meters may indicate infinite resistance in both directions. 	<ol style="list-style-type: none"> <li>1. Unplug microwave oven or disconnect power.</li> <li>2. Measure continuity (ohmmeter scale: Rx1k):</li> <li>3. Measure continuity (ohmmeter scale: Rx1k):</li> </ol>	<p>Forward            ■ Normal: Continuity            Abnormal: Infinite</p> <p>Reverse            ■ Normal: Infinite            Abnormal: Continuity</p>
<b>L.V. Light Transformer</b> 	<ol style="list-style-type: none"> <li>1. Unplug microwave oven or disconnect power.</li> <li>2. Remove wire leads.</li> <li>3. Measure resistance (ohmmeter scale: Rx1):</li> </ol>	<p>Primary winding            ■ 45 ohms (approximate)</p> <p>Secondary winding            ■ 0.6 ohm (approximate)</p>
<b>Cooling Fan Motor</b> 	<ol style="list-style-type: none"> <li>1. Unplug microwave oven or disconnect power.</li> <li>2. Remove wire leads.</li> <li>3. Measure resistance (ohmmeter scale: Rx1):</li> </ol>	<p>Normal: 10 ohms (approximate)            Abnormal: Infinite</p>
<b>Turntable Motor/Stirrer Motor</b> 	<ol style="list-style-type: none"> <li>1. Unplug microwave oven or disconnect power.</li> <li>2. Remove wire leads.</li> <li>3. Measure resistance (ohmmeter scale: Rx1k):</li> </ol>	<p>Turntable Motor            ■ Normal: 2,450 ohms (approximate)            ■ Abnormal: Infinite</p> <p>Stirrer Motor            ■ Normal: 3.3k-4.2k ohms (approximate)            ■ Abnormal: Infinite</p>

# ELECTRONIC CONTROLS

Esterline charts are only for electro-mechanical timers, not electronic controls. There is no easy way to create a timing chart for an electronic controlled unit.

In order to properly troubleshoot either type of unit, the technician will need to:

- Use the tech sheet
- Understand the machine's operation
- Know the user's input to the machine
- Properly use the diagnostics cycle
- Understand and use strip circuits

The technician will need to determine whether the problem is:

- Mechanical
- Electrical
- Consumer-related

To troubleshoot electronic controls, it is often necessary to rule out everything else in the circuit before replacing the control.

Future innovations are the standardization of the electronic controls. The diagnostics mode will be accessed the same no matter what appliance you are servicing.

## SAMPLE EXERCISE

### EXAMPLE

A dishwasher's detergent dispenser door is not opening properly. Use the diagnostics mode to test the dispenser circuit.

The first step will be to enter the diagnostics cycle by following the tech sheet instructions.

### USING THE SERVICE DIAGNOSTICS CYCLE CHART

To start the Service Diagnostics Cycle, press the following keys, in order, in less than 6 seconds, while in standby: Heated Dry, Normal, Heated Dry, Normal.

To rapid advance one interval at a time, press the Start key, noting that unlike standard cycles, the diagnostics cycle automatically resumes after door openings, and does not require pressing Start to resume.

**Continued on the next page.**

# SERVICE DIAGNOSTICS CYCLE

Understanding of the diagnostics cycle chart is very important. The timing for when the loads are energized and for how long are especially important.

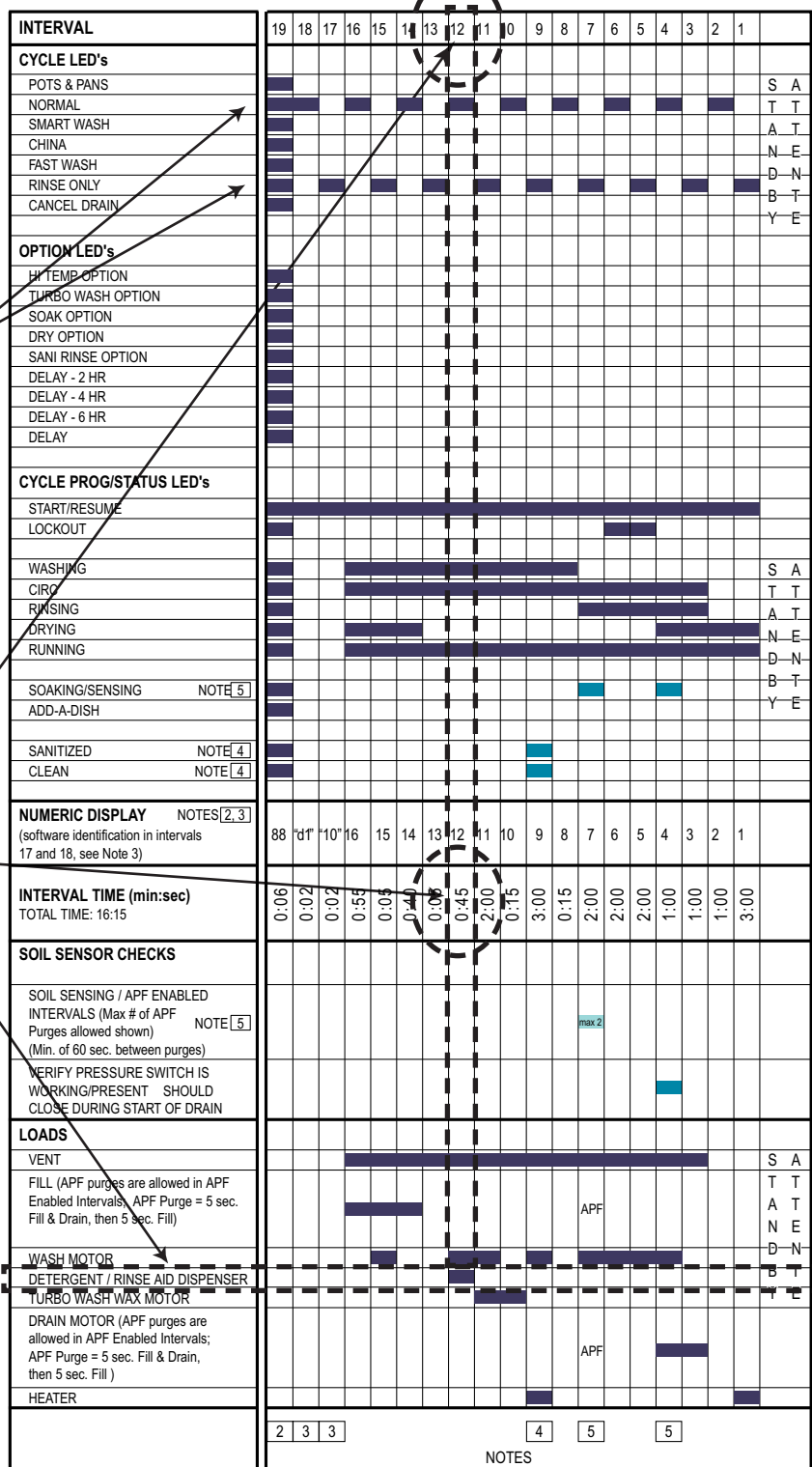
Note that the lights will toggle to help aid the technician in determining what part of the diagnostics cycle the machine is in. It will also show when the load is active.

Find the dark area in the dispenser row, and follow column up to determine the timing length and interval.

The interval at the top of the chart shows when to expect the dispenser load to be activated.

The interval time will show how long the load will be energized.

If the load (dispenser) does not open during the proper time in diagnostics, proceed to the strip circuit.

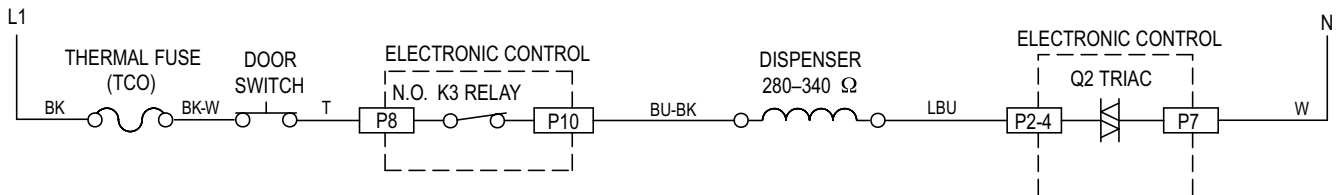


## STRIP CIRCUITS

It is necessary to eliminate all loads and switches before replacing electronic controls. Utilizing strip circuits, such as the one shown below, helps to identify and test the individual loads and switches that are involved with the dispenser circuit. The strip circuit helps to elimi-

Replace the electronic control only when necessary. The key to locating the trouble is to follow the instructions shown on the tech sheet, and to use the information to help solve the problem.

### DISPENSER (DETERGENT & RINSE AID)



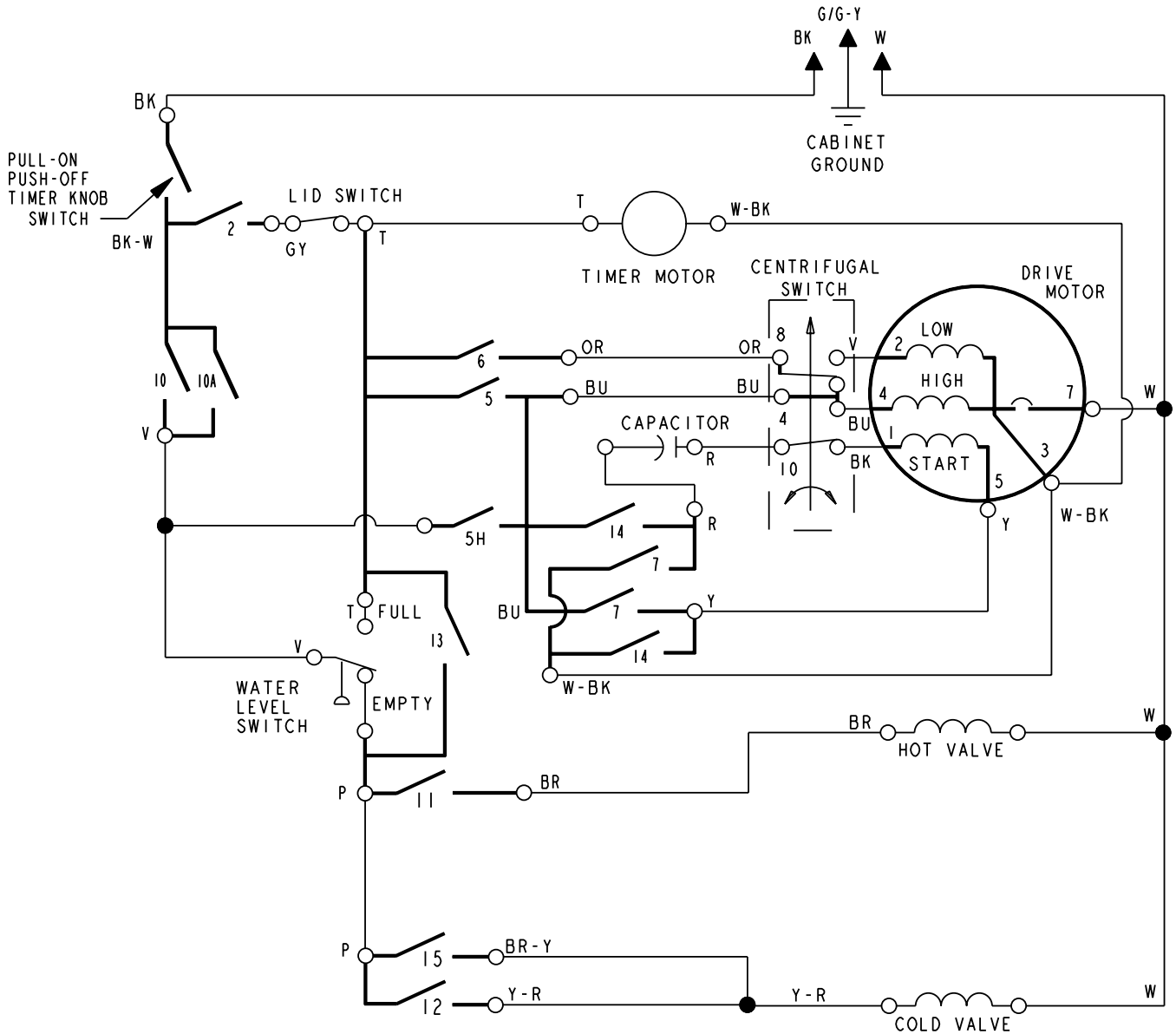
## Exercise 1

[illegible]

◆ INDICATES MOTOR "OFF"

## Exercise 2

Close the proper switches and trace the active circuits.

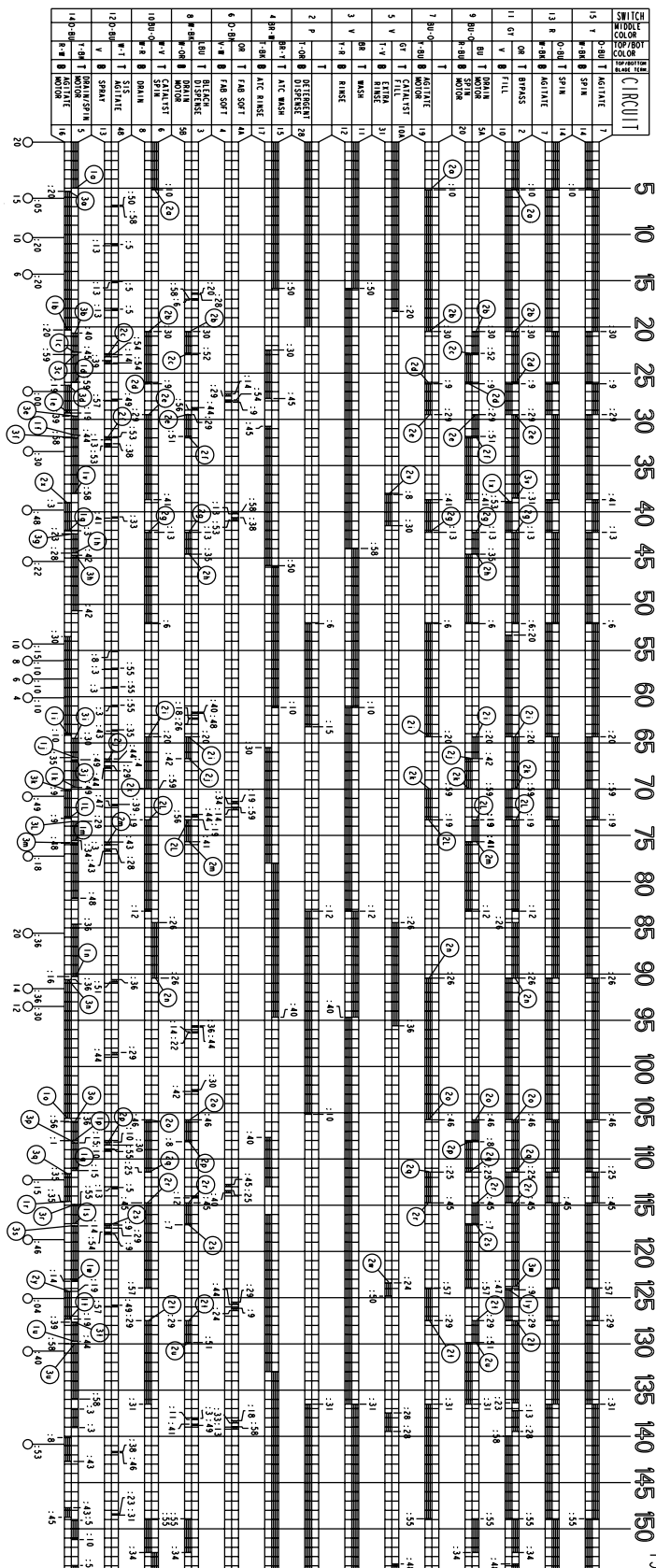
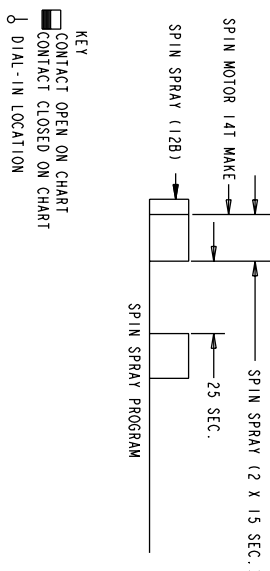


### Exercise 3

Find the closed contacts during the Permanent Press agitate event.

ENGLISH	FRENCH	SPANISH
AGITATE	AGITER	AGITAN
BLEACH	BLANCHIMENT	BLANQUEO
BUZZER	VIDEOR	SEÑAL SONORA
BYPASS	DERIVATION	PUNTE
DRAIN	VIDENT	DRECAN
EXTRA RINSE	RINÇAGE DE PLUS	ADICIONAL ACLARACION
FILL	REMPLISSAGE	LEÑAN
HIGH	HAUT	ALTO
INT AGITATE	AGITER INTERMITTENT	INTERMITENTE AGITE
LO	LENT	BAJO
MED	MED	MEDIA
MOTOR	MOTEUR	MOTOR
NORMAL	SYNTHETIQUE	NORMAL
PERMANENT PRESS	SYNTHETIQUES	PERMANENT PRENSA
PREWASH	PRE LAVAGE	PRE COLADA

ENGLISH	FRENCH	SPANISH
RINSE	RINÇAGE	ACCIÓN DE LAVAR
SOAK	IMBIBIR	REMOLJAN
SPIN	ESSORAGE	VOLETA
SPRAY	CIJAGE	AEROSOL
WASH	LAVAGE	COLADA
THIN FILM	SIMONONISTS REMISSION	SIMONONIZADO
1/2 TUB BATH	1/2 COVETTE	1/2 TUBO DE LA TUBA DEL 1/2
FAB. SOTER	RAQUILLISSANT	SALVADORA DE LA TELA
DETERGENT	DETRENT	DETERGENTE
OFF	ABRIT	DE
COOL DOWN	REFROIDISSEZ	REFRIGERAR
DRI AGITATE	SECHE AGITER	SECO AGITAN
ULTRA CLEAN	ULTRA PROPRE	ULTRA LIMPIO
EXPRESS WASH	1. EXPRES SE LAVE	EXPRESSE EL LAVADO
FACTORY TEST	EXAMEN D'USINE	LA PRUEBA DE LA FABRICA





# Exercise 4

Find the closed contacts during the Permanent Press agitate event. Close the switches for delicate, extra rinse, cold wash and cold rinse, then trace the active circuits.

**LEGEND / LEGENDE / LEYENDA**

**0 -** TIMER SWITCH  
INT. DU PROGRAMMEUR  
INTERUPCIÓN DEL TEMPORIZADOR

**●** INT. COMP CONNECTION  
CONEXIÓN INTERNO DE COMPONENTE

**○** HARNESS WIRING  
FAISCEAU DE FILS  
CABLEADO DEL HARNESS

**○** HARNESS CONNECTION  
CONEXIÓN DE FILS  
CONEXIÓN DEL HARNESS

**○** TERMINAL CONNECTION  
CONEXIÓN DE LA BORNE  
TERMINAL CONEXIÓN

**○** WASH RINSE / RINÇAGE DE LAVAGE  
/ ACLARACIÓN DE LA COLADA

**○** DRIVE MOTOR / MOTEUR / IMPULSOR MOTOR

**L** LOW / LENT / BAJO  
**M** MEDIUM / SUPPORT / MEDIA  
**H** HIGH / HAUT / ALTO

**S** START / DEMARRANT / EMPREZAN

**H** HOT VALVE  
SOUPAPE D'EAU CHAUDE  
CALIENTE VALVULA

**C** COLD VALVE  
SOUPAPE D'EAU FROIDE  
FRIA VALVULA

**BL** BLEACH  
BLANCHIMENT  
BLANQUEO

**OB** OFF BALANCE  
DESÉQUILIBRE  
FUERA DE BALANCE

**DRAIN** DRAIN  
VIDANGE  
DRENAJE

**FAB** FABRIC SOFTENER  
RAMOLLISSANT DE TISSU  
SUAVIZADOR DE LA TELA

**FILL** FILL  
REMPLISSEMENT  
LLENAR

**DET** DETERGENT  
DETERGENT  
DETERGENTE

**TSC** TEMPERATURE SWITCH CHART  
DIAGRAMME DE COMMANDEUR DE LA TEMPERATURE  
CARTE DE INTERUPCIÓN DE LA TEMPERATURA

**W** WATER LEVEL SWITCH  
INTERUPTEUR NIVEAU D'EAU

**R** RECIRCULATE PRESSURE SWITCH  
MANO-CONTACT DE RECIRCULATE  
INTERUPTEUR DE PRESIÓN DEL RECIRCULATE

**○** FULL / PLEIN / POR COMPLETO

**○** EMPTY / VIDE / VACIO

**LID SWITCH**  
INTERUPTEUR DU COUVERCLE  
INTERUPTEUR DE LA TAPA

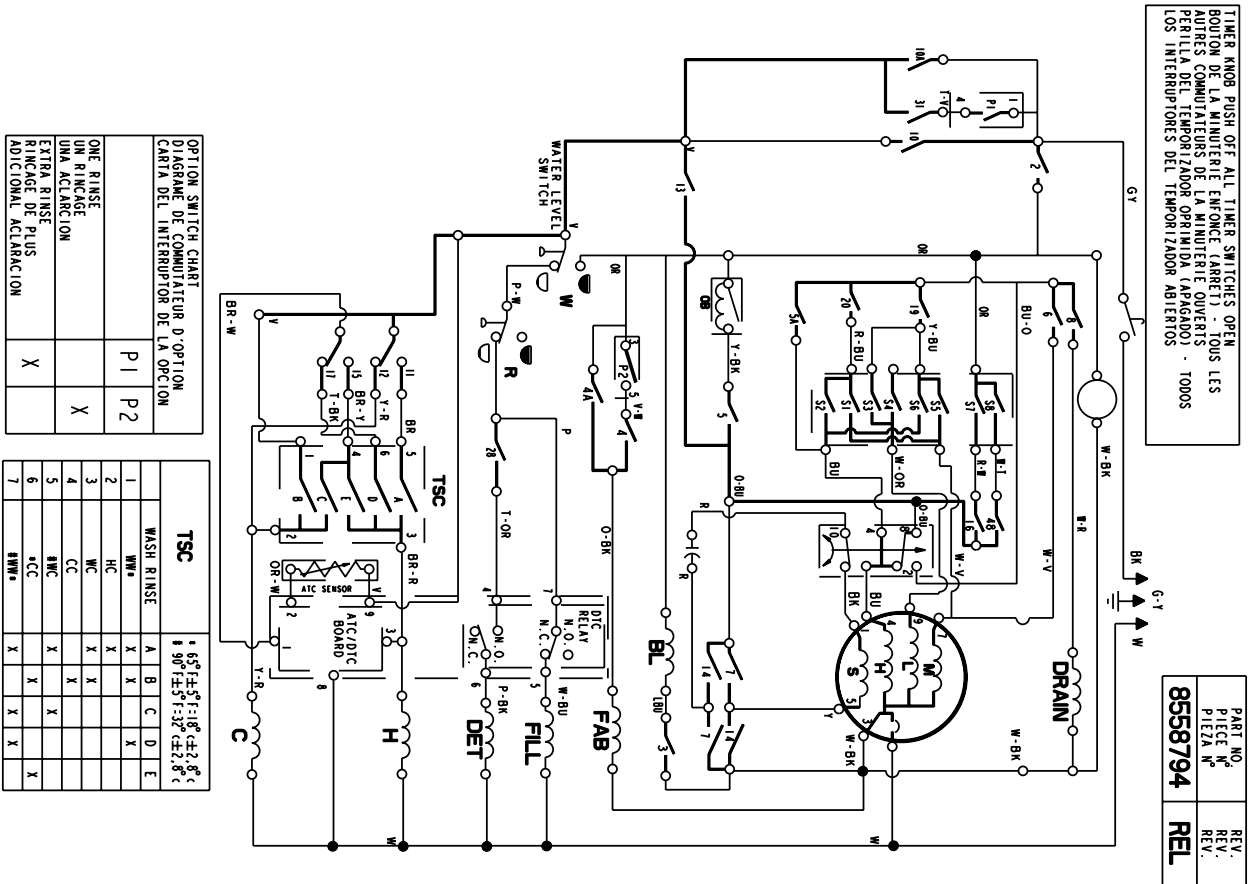
**○** TIMER MOTOR  
MOTEUR DE LA MINUTERIE  
MOTOR DEL TEMPORIZADOR

**○** CENTRIFUGAL SWITCH  
CONTACTEUR CENTRIFUGE  
CENTRIFUGO INTERUPTEUR

**○** CABINET GROUND  
TIGNE DU CHASSIS  
CABIN MOLINA

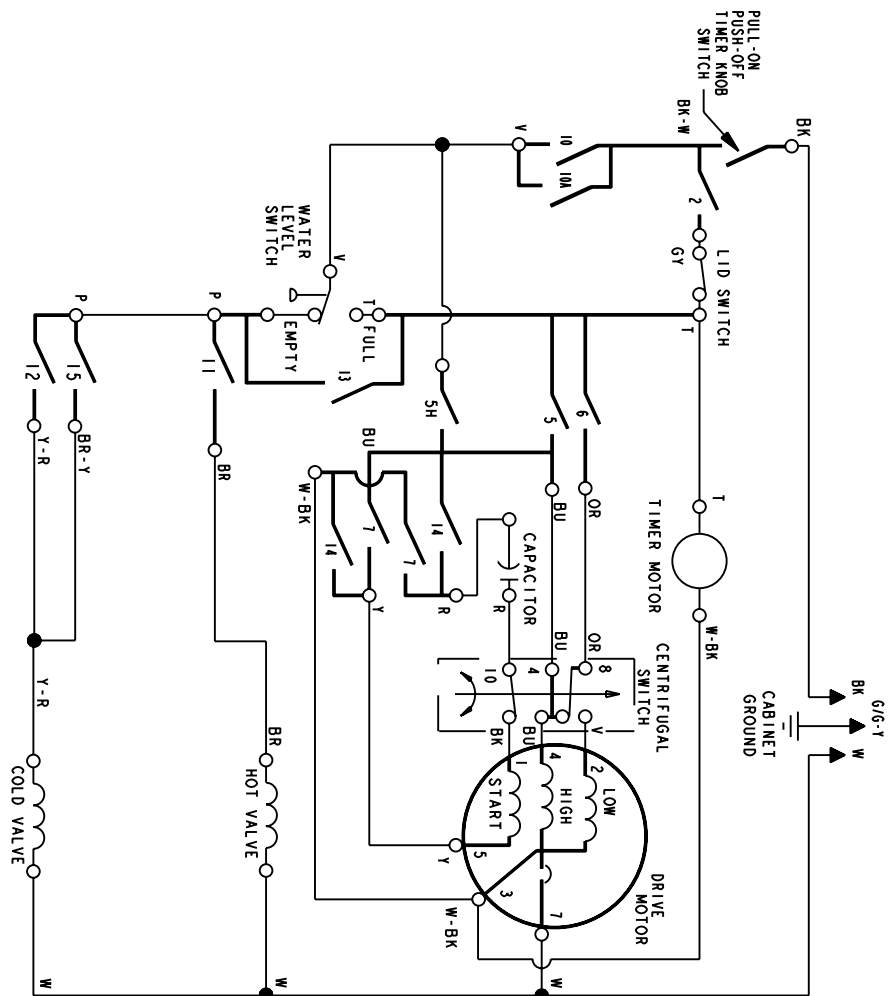
**○** CAPACITOR / CONDENSADOR

FABRIC SELECT MOTOR SPEED SWITCH COMMANDEUR DE VITESSE DE MOTEUR CHOISI DE TISSU INTERUPTEUR DE LA VELOCIDAD DEL MOTOR SELECCIONADO DE LA TELA		CLOSED SWITCHES FERME COMMANDEUR CERRADO INTERUPTEUR												
FABRIC SELECT DIAL CADRAN CHOISI DE TISSU	MOTOR SPEED VITESSE DE MOTEUR	AGITATE AGITANT	SPIN VUELTIA	INT LOW INT BAJO	MEDIUM SUPORT	INT HIGH INT ALTO	EXTRA DELICATE EXTRA SENSIBLE	DELICATE DELICADO	SENSITIVE REGULAR	REGULAR REGULAR	HEAVY DUTY PESADO	RESISTANT ALTO	HANG DRY ACROCHER SEC	ALTO
1	1	X	X	X	X	X	X	X	X	X	X	X	X	X
2	2	X	X	X	X	X	X	X	X	X	X	X	X	X
3	3	X	X	X	X	X	X	X	X	X	X	X	X	X
4	4	X	X	X	X	X	X	X	X	X	X	X	X	X
5	5	X	X	X	X	X	X	X	X	X	X	X	X	X
6	6	X	X	X	X	X	X	X	X	X	X	X	X	X
7	7	X	X	X	X	X	X	X	X	X	X	X	X	X



**120 SECONDS PER STEP**

CM	7.5	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182	189	196	203	210	217	224	231	238	245	252	259	266	273	280	287	294	301	308	315	322	329	336	343	350	357	364	371	378	385	392	399	406	413	420	427	434	441	448	455	462	469	476	483	490	497	504	511	518	525	532	539	546	553	560	567	574	581	588	595	602	609	616	623	630	637	644	651	658	665	672	679	686	693	700	707	714	721	728	735	742	749	756	763	770	777	784	791	798	805	812	819	826	833	840	847	854	861	868	875	882	889	896	903	910	917	924	931	938	945	952	959	966	973	980	987	994	1001	1008	1015	1022	1029	1036	1043	1050	1057	1064	1071	1078	1085	1092	1099	1106	1113	1120	1127	1134	1141	1148	1155	1162	1169	1176	1183	1190	1197	1204	1211	1218	1225	1232	1239	1246	1253	1260	1267	1274	1281	1288	1295	1302	1309	1316	1323	1330	1337	1344	1351	1358	1365	1372	1379	1386	1393	1400	1407	1414	1421	1428	1435	1442	1449	1456	1463	1470	1477	1484	1491	1498	1505	1512	1519	1526	1533	1540	1547	1554	1561	1568	1575	1582	1589	1596	1603	1610	1617	1624	1631	1638	1645	1652	1659	1666	1673	1680	1687	1694	1701	1708	1715	1722	1729	1736	1743	1750	1757	1764	1771	1778	1785	1792	1799	1806	1813	1820	1827	1834	1841	1848	1855	1862	1869	1876	1883	1890	1897	1904	1911	1918	1925	1932	1939	1946	1953	1960	1967	1974	1981	1988	1995	2002	2009	2016	2023	2030	2037	2044	2051	2058	2065	2072	2079	2086	2093	2100	2107	2114	2121	2128	2135	2142	2149	2156	2163	2170	2177	2184	2191	2198	2205	2212	2219	2226	2233	2240	2247	2254	2261	2268	2275	2282	2289	2296	2303	2310	2317	2324	2331	2338	2345	2352	2359	2366	2373	2380	2387	2394	2401	2408	2415	2422	2429	2436	2443	2450	2457	2464	2471	2478	2485	2492	2499	2506	2513	2520	2527	2534	2541	2548	2555	2562	2569	2576	2583	2590	2597	2604	2611	2618	2625	2632	2639	2646	2653	2660	2667	2674	2681	2688	2695	2702	2709	2716	2723	2730	2737	2744	2751	2758	2765	2772	2779	2786	2793	2800	2807	2814	2821	2828	2835	2842	2849	2856</
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PART NO. NUMERO DE PIECE NUMERO DE PIEZA	REV REVISION REVISION
3954706	A

LEGEND

0 — TIMER SWITCH

13 — SUB-INTERVAL SWITCH

INT. COMP CONNECTION

HARNES WIRING

● HARNES CONNECTION

○ TERMINAL CONNECTION

X TIMER SWITCH MAY BE OPEN OR CLOSED

# **PRODUCT SPECIFICATIONS AND WARRANTY INFORMATION SOURCES**

## ***IN THE UNITED STATES:***

**FOR PRODUCT SPECIFICATIONS AND WARRANTY INFORMATION CALL:**

**FOR WHIRLPOOL PRODUCTS: 1-800-253-1301**

**FOR KITCHENAID PRODUCTS: 1-800-422-1230**

**FOR ROPER PRODUCTS: 1-800-447-6737**

**FOR TECHNICAL ASSISTANCE WHILE AT THE CUSTOMER'S HOME CALL:**

**THE TECHNICAL ASSISTANCE LINE: 1-800-253-2870**

**HAVE YOUR STORE NUMBER READY TO IDENTIFY YOU AS AN  
AUTHORIZED SERVICER**

**FOR LITERATURE ORDERS:**

**PHONE: 1-800-851-4605**

**FOR TECHNICAL INFORMATION AND SERVICE POINTERS:**

**[www.servicematters.com](http://www.servicematters.com)**

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## ***IN CANADA:***

**FOR PRODUCT SPECIFICATIONS AND WARRANTY INFORMATION CALL:**

**1-800-461-5681**

**FOR TECHNICAL ASSISTANCE WHILE AT THE CUSTOMER'S HOME CALL:**

**THE TECHNICAL ASSISTANCE LINE: 1-800-488-4791**

**HAVE YOUR STORE NUMBER READY TO IDENTIFY YOU AS AN  
AUTHORIZED SERVICER**



[Fixitnow.com](http://Fixitnow.com) Samurai Appliance Repair Man