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ABSTRACT

This project was designed to collect information on the types of skills common to the appliance repair, refrigeration, and air conditioning service areas. A single task inventory was constructed from available course materials, revised by consultants, and administered to a random sample of 30 incumbent workers in each of the two service areas in two counties of Arizona. Completed task inventory forms were analyzed by computer with the tasks ranked according to percent of sample performing each task and time spent by workers performing each task. A report of the analyzed data was distributed to teachers in Arizona to be used as a basis for curriculum revision. This report defines the problem area and describes the goals and objectives, procedures, design and methodology, selection of sample, administration of inventory, and data analysis. Tables provide information about distribution of respondents by job title and years of experience, mean years of experience in service area by job title, and frequency of responses to the question of where training was received by service area. Also included are the task inventory instrument and the task analysis which indicates percentage of respondents performing task and time spent ratings. (NJ)

FINAL REPORT

PROJECT NO. 76-RMG-1305

A SURVEY OF COMMON ELEMENTS IN APPLIANCE REPAIR, REFRIGERATION AND AIR CONDITIONING

Conducted Under
Section 131(b) Part C of Public Law 90-576

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Flagstaff, Arizona 86001

June 30, 1976

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ABSTRACT

PROJECT TITLE: A Survey of Common Elements in Appliance Repair, Refrigeration and Air Conditioning

AGENCY: Northern Arizona University
Flagstaff, Arizona 86001

PROJECT DIRECTOR: Clair S. Hill, Ph.D.
Industrial Education Department

DURATION: May 17, 1976 to June 30, 1976

COSTS: RCU $4,335.00 TOTAL $4,335.00

DESCRIPTION OF PROJECT: This project was designed to collect information on the types of skills which were common to the Appliance Repair, Refrigeration and Air Conditioning service areas. These skills along with skills from the Automotive service areas, which have been identified in previously conducted task inventories, could be merged together to form common skill elements for a Mechanical Service cluster course at the high school level.

A single task inventory was constructed from available course materials. This initial task inventory was then revised under the supervision of two consultants who were employed in each of the two service areas.

The revised inventory was administered to a random sample of thirty incumbent workers in each of the two service areas in Maricopa and Coconino counties.

OUTCOMES: Completed task inventory forms were analyzed utilizing the computer at Northern Arizona University. Tasks were ranked according to percent of sample performing each task and time spent by workers performing each task.

A report of the analyzed data obtained from the task inventory was distributed to teachers in Arizona who were teaching or planning to teach one of the mechanical service areas. This material could be used as a basis for curriculum revision and be further validated by local advisory committees.

BODY OF THE REPORT

Problem Area

The 1975-76 Arizona State Plan for Vocational Education in Arizona indicated that there was a basic need for research to identify common skill and knowledge competencies in various occupational areas. It specifically stated that there was a need to identify or develop a task inventory for the mechanical services cluster. These competencies, when derived from workers on the job, could be used by instructors to keep their course content up-to-date and relative to current job skills and knowledge.

The Arizona Department of Economic Security estimated that approximately five hundred twenty new job opportunities would develop for air conditioning and refrigeration servicemen in the state between 1975 and 1978. Four hundred eighty new job opportunities would develop for appliance servicemen. Through the 1970's it was projected that Arizona could expect a "faster than average" growth among service workers.

At the time of this project there were three high school programs for refrigeration and air conditioning in the state. Programs for appliance repair were non-existant at the high school level.

A search of the literature revealed that only a single task inventory was available from the Ohio State Department of Education in air conditioning and refrigeration. No task inventories had been developed for appliance repair. Several states including Missouri, New Jersey, Florida, Mississippi and Texas have developed curriculum materials for the air conditioning and refrigeration area. A few states had also developed curriculum materials for the appliance repair area. A course outline developed by the Association of Home Appliance Manufacturers was also useful for developing the initial task inventory. These curriculum materials were utilized for producing the initial task inventory. Only those tasks which were thought to be performed by incumbent workers were included.

Goal and Objectives

The goal of this project was to provide instructors with an up-to-date analysis which shows the common skill and knowledge elements in the appliance repair, refrigeration and air conditioning service occupations so that job preparation for a number of the job areas in the mechanical services cluster may result.

Objectives were as follows:

1.1 On or before June 1, 1976, the Project director and a consultant in each of the two service areas compiled an initial task inventory which contained at least 200 common elements from the appliance repair, air conditioning

and refrigeration service areas. The initial task inventory was revised by two consultants who were employed in each of the service areas.

1.2 On or before June 15, 1976, the Project director selected a random sample of thirty incumbent workers from each of the two service areas in Maricopa and Coconino counties and administered the revised task inventory. Follow-up procedures were employed to insure a 70% return of completed survey forms.

1.3 On or before June 30, 1976, the Project director supervised the analysis of the data and distributed a report to each mechanical service teacher in the state. The report ranked tasks according to percent of sample performing each task and time spent by workers in performing tasks.

Procedures Followed

1.1.1 An initial task inventory was constructed from available published source materials. Revision of the initial inventory was conducted by two consultants employed in each of the two service areas. They reviewed and helped revise the initial inventory so that workers on the job could readily interpret the inventory.

1.2.1 From the roster of electrical contractors and associated firms provided by the Electric League of Arizona, a total of three major air conditioning firms was selected. A random sample of thirty incumbent servicemen was selected from each of the two service areas. Task inventories were delivered to the supervisors in charge of the sixty workers. These supervisors were given verbal and written instructions as to the administration of the task inventory. A telephone call and personal visit were used to insure a 70% return completion.

1.3.1 The procedure for conducting a task inventory as advocated by the Center for Vocational and Technical Education at the Ohio State University was followed in the survey and the analysis of the data. Computer programs developed at the Northern Arizona University were utilized. A report of the analyzed data obtained from the task inventory was distributed to teachers in the mechanical service areas who attended the fall Vocational Education Conference on August 13 and 14, 1976. Additional copies were delivered to the Arizona Department of Education, Division of Vocational and Career Education for further dissemination.

Project Design and Methodology

An initial task inventory was developed by searching existing

appliance repair, air conditioning and refrigeration text books, curriculum guides and courses of study. Only the tasks that were thought to be performed by an incumbent worker in these service areas were included. The primary sources of task statements were:

(1) An Analysis of the Air Conditioning, Refrigeration and Heating Occupations (1975)
Frass, Melvin R.; Krause, Marvin
Ohio State Department of Education
The Ohio State University
Columbus, Ohio 43210

(2) Course Outlines for: Refrigeration, Air Conditioning and Appliance Repair (1973)
Dade County Public Schools
Miami, Florida

(3) Air Conditioning and Refrigeration-Instructor's Guides (1973)
University of Missouri
Instructional Materials Laboratory
Columbia, Missouri 65201

(4) Training the Home Appliance Technician (1971 Curriculum Guide)
Association of Home Appliance Manufacturers
20 North Wacker Drive
Chicago, Illinois 60606

(5) Instructional Texts & Materials - Appliance Repair
Whirlpool Corporation
Benton Harbor, Michigan 49022

(6) Curriculum Guide - Levels III & IV - Appliance Repair (1971)
Westinghouse Area Vocational High School
City of Chicago Board of Education
Chicago, Illinois

(7) Modern Refrigeration and Air Conditioning Laboratory Manual (1968)
The Goodheart-Willcox Co., Inc.
South Holland, Illinois

After the initial identification, the tasks were grouped into areas called duties. The duty categories for the project were identified as:

A. Working with the Public & Customer Relations
B. Using Hand and Power Tools
C. Soldering, Brazing & Welding
D. Testing Electrical Circuits & Components
E. Making Mechanical Repairs

F. Repairing Refrigerators and Freezers
G. Repairing Ranges
H. Repairing Washing Machines
I. Repairing Dryers
J. Repairing Dishwashers
K. Repairing Disposals
L. Repairing Window Air Conditioners
M. Troubleshooting Refrigeration and Air Conditioning Equipment
N. Servicing & Repairing Refrigeration & Air Conditioning Equipment

Task statements were then assigned to duty statements in the sequential order in which they were normally performed on the job. These task statements were listed in sequential order under each duty so that the incumbent service technician could follow the sequence of servicing an appliance or a unit in his mind as he completed the task inventory.

The initial task inventory was then reviewed and revised by two consultants from each of the two service areas. Mr. Kenyon P. Whitney, Service Manager, Climate Control Co., Inc., and Mr. Chic Hope, owner of Hope's Appliance & T.V. Service served as the final evaluators for the final task inventory.

Each consultant was asked to respond to each task statement individually and comment on its clarity, appropriateness and order in the sequence. One major duty statement was eliminated and two other duty statements were combined. Many task statements were changed or added to make the final inventory of two hundred sixty-seven task statements.

Selection of the Worker Sample

Because this study was conducted during the busy season of a very seasonal type of service work, a minimum number of companies was utilized. Six major companies were used which were recommended by the Executive Director of the Electric League of Arizona.

A random sample of thirty incumbent workers in each service area was selected for the study. These workers were employed by the six companies as service technicians. The majority of the technicians worked out of service trucks. A few of the technicians worked in the shop.

Administration of Inventory

Task inventory forms were personally delivered to the immediate supervisor in charge of the servicemen in each company. The purpose of the study was briefly explained to the supervisor as follows: Each respondent was to complete the four background information questions on the cover page of the inventory form. Next he was asked to read the directions on the first page of the inventory. At this point, if there were no questions, he then checked the tasks which he

performed and rated the tasks which he had checked on a five (5) point relative time-spent scale. A rating of one (1) indicated that he spent very little time on that task compared with other tasks he performed. A rating of five (5) indicated that he spent an above average amount of time on that task.

The supervisor was to administer the inventory to his workers at the weekly or monthly service meeting. Only those workers who had been chosen in the random sample completed the inventories. The completed forms were then mailed by the supervisor to the University for processing. Examples of the cover page and inventory are included in Appendix A.

A total of twenty-three inventories was completed and returned from appliance repair servicemen. Three of these were not completed properly or only completed partially. Twenty of these inventories were used in the final analysis of the data.

Twenty-one inventories were returned which had been completed by air conditioning and refrigeration servicemen. Twenty of these were used in the final data analysis.

Data Analysis

In order to make comparisons between incumbent workers on specific tasks, the relative time-spent ratings were converted to percentage values. These values were regarded as estimates of the percentage of work time spent by the respondent on each task. It was assumed that the sum of the respondent's raw ratings represented 100 percent of his work time. Based on this assumption, each raw rating was expressed as a percentage of that total. The following formula was used in converting the raw ratings to percentages of time spent on each task:

$$\text{Percentage of time for each task} = \frac{\text{individual raw rating}}{\text{sum of all raw ratings by that individual}}$$

Background Information Summary

An analysis of the data from the background information cover page presented some interesting findings. The distribution of respondents by job title and years of experience (Table 1) indicated that 39.6 percent of the respondents were employed as appliance repair servicemen. Fifty-one percent were employed as refrigeration and air conditioning repair servicemen. Almost two percent were employed as a supervisor. About 7.5 percent indicated the job title of "other." "Other" was specified as: office, owner, dispatcher and accredited technician. The total number of respondents was forty. However, several respondents marked more than one job title on their inventory. Six respondents marked both appliance repair and refrigeration and air conditioning as a dual job title.

TABLE I. DISTRIBUTION OF RESPONDENTS BY JOB TITLE AND NUMBER OF YEARS OF EXPERIENCE

YEARS OF EXPERIENCE		JOB TITLE			
		Appliance Repair	Refrigeration & Air Conditioning Repair	Supervisor	Other
1-2	(N)	1	1	0	0
	( )	2	2	0	0
3-5	(N)	6	4	0	2
	(%)	11	7	0	4
6-10	(N)	5	12	1	1
	(%)	9	23	2	2
11-15	(N)	4	5	0	1
	(%)	7	9	0	2
16-20	(N)	2	1	0	0
	(%)	4	2	0	0
over 20	(N)	3	4	0	0
	(%)	6	7	0	0

NOTE: The total number of respondents was forty (40). However, several respondents marked more than one job title on their inventory.

The largest proportion of the refrigeration and air conditioning repair servicemen had an average of six to ten years of work experience. The largest proportion of appliance repair servicemen had three to five years of work experience.

The respondents were a stable group with a number of years in the service area as indicated by Table 2. The overall mean years of experience for the total sample of forty was 10.44 years. Appliance repairmen averaged 11.0 years of experience. Refrigeration and air conditioning repairmen averaged 9.9 years of experience.

TABLE 2. MEAN YEARS OF EXPERIENCE IN THE SERVICE AREA BY JOB TITLE

JOB TITLE	MEAN YEARS WORKED IN SERVICE AREA
Appliance Repairman	11.0
Refrigeration & Air Conditioning Repairman	9.9
Overall Mean	10.44

The workers' responses by job title to the question of where they received their training are given in Table 3. It should be noted that a respondent could have checked more than one source of training.

The largest proportion (80 percent) of respondents in all positions received training on-the-job; 43.4 percent received training in private vocational schools. Most of these private schools are sponsored by the large manufacturers of appliances and air conditioning units. Thirty-four and a half (34.5) percent obtained at least part of their training through an apprenticeship program; 21.1 percent received training in the military. These were the major sources of training.

TABLE 3. FREQUENCY OF RESPONSES TO THE QUESTION OF WHERE THEY RECEIVED THEIR TRAINING BY SERVICE AREA

TYPE OF TRAINING		JOB TITLE	
		Appliance Repair	Refrigeration & Air Conditioning Repair
On-the-job (self-learned)	(N)	14	12
	(%)	46.7	33.3
Military School	(N)	3	4
	(%)	10.0	11.1
Private Vocational School	(N)	8	6
	(%)	26.7	16.7
Apprenticeship Program	(N)	2	10
	(%)	6.7	27.8
High School Program	(N)	1	1
	(%)	6.7	2.7
Community College Program	(N)	1	2
	(%)	3.3	5.6
Adult Education Program	(N)	1	1
	(%)	3.3	2.8
TOTAL	(N)	30	36
	(%)	100	100

NOTE: Any single respondent may have indicated more than one training program.

Task Analysis

The task analysis for all respondents employed in the two service areas is given in Table 4. The letter and number in the column labeled D-TSK (duty-task) refers to the location of the task on the task inventory which was administered to the respondents. The letter refers to the duty heading under which the task was categorized and the number indicates the placement of the task under that duty heading. A complete list of the duties and task statements is given in Appendix A.

The four columns of figures to the right of the task statements have been calculated to show: (1) percent of members performing each task, (2) average relative time spent by the members performing the task, (3) average relative time spent by all members, and (4) cumulative sum of the average percent time spent by all members.

Examination of the task analysis revealed that a variety of tasks were performed by both groups of service workers as a part of their normal job. The tasks are listed in order of the percent of members performing as shown in the first column. Although many of the tasks received a rather low rating, these tasks are rather specialized and are performed by only one of the service areas. These tasks would be taught in a specialized course.

Recommendations

This study indicates the common tasks related to appliance repair, refrigeration and air conditioning. The analysis provided in Table 4 should be further validated by local advisory committees. After validation it can be merged with the tasks from the automotive service area and used as a basis for a mechanical service cluster program at the high school level.

TABLE 4. TASK ANALYSIS INDICATING PERCENTAGE PERFORMING AND TIME SPENT RATINGS

CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING--
RANKED BY PERCENT OF MEMBERS PERFORMING----------

D-TSK	TASK TITLE				
A 08	Listen to customer's complaints & observations	.9500	.0255	.0243	.0243
A 09	Test unit & diagnose trouble	.9500	.0106	.0100	.0343
A 11	Estimate job costs & explain to customer	.9500	.0124	.0118	.0461
A 10	Explain malfunction & repairs needed	.9250	.0089	.0082	.0543
A 12	Perform service or repairs required	.9250	.0097	.0090	.0633
A 13	Check unit for proper operation	.9250	.0096	.0088	.0721
A 15	Complete the service order	.9250	.0071	.0066	.0787
A 16	Obtain customer's signature	.9250	.0052	.0048	.0835
B 02	Care for and maintain hand tools	.9250	.0061	.0056	.0891
B 04	Use screwdrivers	.9250	.0077	.0071	.0962
B 05	Use wrenches, sockets and nutdrivers	.9250	.0083	.0077	.1039
B 12	Use pliers and wire strippers	.9250	.0085	.0079	.1118
D 02	Read electrical wiring diagrams	.9250	.0076	.0071	.1189
D 06	Use volt-ohmmeter	.9250	.0081	.0075	.1264
D 19	Replace wires and make connections	.9250	.0074	.0069	.1333
D 24	Check a solenoid valve	.9250	.0066	.0061	.1394
D 28	Check components & wiring of a 120 volt circuit	.9250	.0075	.0070	.1464
D 29	Check components & wiring of a 240 volt circuit	.9250	.0078	.0072	.1536
A 04	Explain guarantee or warranty status	.9000	.0169	.0152	.1688
A 07	Establish route & travel to destination	.9000	.0118	.0106	.1794
A 14	Clean-up servicing area & unit	.9000	.0076	.0068	.1862
B 07	Cut metal with hack saw	.9000	.0039	.0035	.1897
B 09	Use punches	.9000	.0048	.0043	.1940
B 11	File metal	.9000	.0050	.0045	.1985
B 14	Operate electric hand drill	.9000	.0047	.0042	.2027
B 18	Use tube cutting and reaming tools	.9000	.0063	.0057	.2084
D 01	Identify electrical components	.9000	.0056	.0051	.2135
D 09	Use test probes	.9000	.0074	.0066	.2201
D 17	Adjust and test switches	.9000	.0059	.0053	.2254
D 18	Check circuit protective devices	.9000	.0062	.0056	.2310

CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING---
RANKED BY PERCENT OF MEMBERS PERFORMING----------

D-TSK	TASK TITLE				
A 06	Obtain service schedule assignment from dispatcher	.8750	.0072	.0063	.2373
B 08	Use chisels	.8750	.0039	.0034	.2407
B 10	Use hammers and mallets	.8750	.0054	.0047	.2454
B 17	Use flaring and swaging tools	.8750	.0052	.0045	.2499
B 19	Use refrigeration charging tools	.8750	.0081	.0070	.2569
D 05	Use ohmmeter	.8750	.0074	.0065	.2634
D 25	Check and adjust a thermostat	.8750	.0068	.0060	.2694
D 31	Test a capacitor-start hermetic motor	.8750	.0074	.0065	.2759
E 11	Install belts and adjust pulleys and belts	.8750	.0080	.0070	.2829
E 12	Measure temperatures	.8750	.0087	.0076	.2905
C 01	Fit parts & clean surfaces	.8500	.0067	.0057	.2962
C 02	Apply flux	.8500	.0056	.0048	.3010
C 04	Clean joints (flux)	.8500	.0055	.0046	.3056
D 20	Check a current relay	.8500	.0056	.0047	.3103
D 22	Check a thermal relay	.8500	.0064	.0054	.3157
E 13	Test for leaks	.8500	.0092	.0078	.3235
C 03	Operate soldering gun, copper or torch	.8250	.0056	.0046	.3281
C 08	Apply flux	.8250	.0061	.0050	.3331
C 09	Adjust regulator	.8250	.0056	.0046	.3377
C 10	Light torch	.8250	.0051	.0042	.3419
C 11	Adjust flame	.8250	.0058	.0048	.3467
C 16	Clean joints (flux)	.8250	.0047	.0038	.3505
D 12	Use time and temperature recorder	.8250	.0046	.0038	.3543
D 32	Test & operate a capacitor-start capacitor-run hermetic motor	.8250	.0083	.0068	.3611
E 02	Make flared tube connections	.8250	.0060	.0049	.3660
E 03	Repair soldered or brazed connection	.8250	.0064	.0053	.3713
E 04	Make a swaged tubing connection	.8250	.0067	.0055	.3768
E 07	Operate service valves	.8250	.0071	.0059	.3827
E 16	Evacuate a system	.8250	.0079	.0066	.3893

D-TSK	TASK TITLE	RANKED BY PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
E 17	Use a service cylinder	.8250	.0075	.0062	.3955
B 20	Use flywheel pullers	.8000	.0040	.0032	.3987
C 06	Clean metal	.8000	.0068	.0055	.4042
C 07	Assemble & support parts	.8000	.0067	.0054	.4096
D 10	Use dial thermometer	.8000	.0070	.0056	.4152
D 16	Wire circuits and check measurements	.8000	.0053	.0043	.4195
D 30	Test an open type capacitor-start motor	.8000	.0065	.0052	.4247
E 06	Operate gauge manifold	.8000	.0088	.0070	.4317
E 15	Repair a leak using epoxy compounds	.8000	.0057	.0045	.4362
B 03	Measure with steel rule or tape	.7750	.0034	.0026	.4388
B 21	Use pump service tools	.7750	.0057	.0044	.4432
C 05	Fit mating parts & establish clearances	.7750	.0067	.0052	.4484
C 15	Silver braze copper alloys	.7750	.0057	.0045	.4529
D 04	Thermocouple temperature tester	.7750	.0058	.0045	.4574
D 07	Use volt-wattmeter	.7750	.0072	.0056	.4730
D 08	Use clamp-on volt ammeter	.7750	.0058	.0045	.4675
D 23	Check a solid state relay	.7750	.0051	.0040	.4715
E 01	Identify assembly devices and tools	.7750	.0073	.0056	.4771
E 08	Install & test access valves & process tube adaptors	.7750	.0075	.0058	.4829
C 22	Light torch	.7500	.0057	.0043	.4872
C 23	Adjust flame	.7500	.0058	.0044	.4916
D 21	Check a potential relay	.7500	.0053	.0040	.4956
A 02	Prepare service order	.7250	.0170	.0124	.5080
C 17	Shut off valve & bleed off acetylene	.7250	.0057	.0041	.5121
C 21	Select proper rod & torch tips	.7250	.0065	.0047	.5168
E 05	Make a complete tubing assembly	.7250	.0071	.0052	.5220
C 12	Braze mild steel	.7000	.0051	.0036	.5256
D 27	Check components & Wiring of a 24 volt circuit	.7000	.0061	.0042	.5298
G 18	Set up and test equipment	.6750	.0051	.0034	.5332
C 24	Weld mild steel	.6750	.0051	.0034	.5366

D-TSK	TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING	RANKED BY PERCENT OF MEMBERS PERFORMING
C 19	Fit mating parts	.6500	.0064	.0042	.5408
E 14	Install guages on an external drive refrigerating system	.6500	.0076	.0049	.5457
A 05	Establish method of payment	.6250	.0161	.0101	.5558
A 17	Make call-back to check customer satisfaction	.6250	.0046	.0029	.5587
B 22	Use hand truck	.6250	.0047	.0030	.5617
C 20	Clamp and support parts	.6000	.0039	.0024	.5641
C 27	Cut using oxyacetylene	.6000	.0035	.0021	.5662
C 25	Weld pipe	.5750	.0055	.0032	.5694
D 26	Dismantle, repair & assemble a single-phase motor	.5500	.0046	.0025	.5719
E 09	Dismantle, assemble and test external drive piston type compressor	.5500	.0080	.0044	.5763
C 14	Silver braze stainless steel	.5250	.0049	.0026	.5789
D 14	Use sling psychromoter	.5250	.0045	.0024	.5813
B 01	Identify and replace unsafe tools	.5000	.0042	.0021	.5834
B 06	Use torque wrench	.5000	.0046	.0023	.5857
D 11	Use thermistor temperature tester	.5000	.0038	.0019	.5876
E 10	Dismantle, assemble and test an external drive rotary type compressor	.5000	.0078	.0039	.5915
M 02	Check circuitry of the compressor protector and relay	.5000	.0075	.0037	.5952
M 03	Check relay	.5000	.0072	.0036	.5988
M 05	Check circulation fan motors	.5000	.0077	.0039	.6027
M 07	Attach manifold and gauges to service valves and check pressure	.5000	.0083	.0042	.6069
M 08	Install in-line service valves and measure pressures	.5000	.0065	.0033	.6102
M 09	Check compressor efficiency	.5000	.0066	.0033	.6135
M 10	Locate leak in a refrigeration system using electronic leak detector	.5000	.0061	.0031	.6166
M 11	Locate leak in a refrigeration system using halide torch	.5000	.0085	.0042	.6208

CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS---------- I
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING--- I I
RANKED BY PERCENT OF MEMBERS PERFORMING---------- I I I
I I I I

D-ISK	TASK TITLE				
M 12	Locate leak in a refrigeration system using bubble method	.5000	.0088	.0044	.6252
M 13	Check unit operation-oil level-sight glass-moisture indicator	.5000	.0105	.0053	.6305
M 15	Check, test and adjust thermostatic expansion valve	.5000	.0068	.0034	.6339
M 17	Check and adjust low pressure safety control	.5000	.0064	.0032	.6371
M 18	Check and adjust high pressure safety control	.5000	.0064	.0032	.6403
M 19	Adjust and calibrate oil pressure control	.5000	.0049	.0025	.6428
M 21	Check and adjust water valve	.5000	.0044	.0022	.6450
M 25	Check condensate pump and drain	.5000	.0069	.0035	.6485
M 26	Check blower assembly and filter	.5000	.0081	.0041	.6526
M 27	Check heat pump reversing system	.5000	.0076	.0038	.6564
N 01	Evacuate a refrigeration system	.5000	.0078	.0039	.6603
N 02	Pump system down into receiving tank	.5000	.0047	.0023	.6626
N 03	Recharge system using sight glass	.5000	.0087	.0044	.6670
N 04	Recharge system weighing in refrigerent	.5000	.0040	.0020	.6690
N 10	Remove and replace capacitor	.5000	.0065	.0033	.6723
N 14	Remove and replace fan motors	.5000	.0087	.0044	.6767
N 15	Repair leak in copper lines of system	.5000	.0084	.0042	.6809
N 16	Remove and replace compressor	.5000	.0090	.0045	.6854
N 17	Add oil to system	.5000	.0078	.0039	.6893
N 21	Remove and replace thermostatic expansion valve	.5000	.0072	.0036	.6929
N 22	Install a drier, sight glass or moisture indicator	.5000	.0075	.0038	.6967
N 23	Remove and replace high or low pressure safety control	.5000	.0087	.0043	.7010
N 30	Balance the air conditioning system	.5000	.0084	.0042	.7052
N 31	Check and replace filters - clean indoor & outdoor coils	.5000	.0106	.0053	.7105
B 13	Operate bench grinder	.4750	.0040	.0019	.7124
M 01	Hook hermetic compressor directly to power supply	.4750	.0068	.0032	.7156

CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING---
RANKED BY PERCENT OF MEMBERS PERFORMING----------

D-TSK	TASK TITLE				
M 06	Check and adjust control thermostat	.4750	.0074	.0035	.7191
M 23	Check humidity with sling psychrometer	.4750	.0031	.0015	.7206
M 24	Check and adjust humidstat	.4750	.0048	.0023	.7229
N 05	Fill dial a charge	.4750	.0040	.0019	.7248
N 06	Recharge a refrigeration system using dial a charge	.4750	.0041	.0019	.7267
N 07	Remove and replace control thermostat	.4750	.0054	.0026	.7293
N 09	Remove and replace motor overload protector	.4750	.0055	.0026	.7319
N 25	Remove and replace oil pressure safety control	.4750	.0082	.0039	.7358
N 28	Remove and replace condensation pump motor	.4750	.0043	.0020	.7378
B 23	Use dollie	.4500	.0049	.0022	.7400
C 13	Braze cast iron	.4500	.0024	.0011	.7411
C 26	Weld cast iron	.4500	.0032	.0015	.7426
M 22	Check hot gas defrost dolenoid and valve	.4500	.0030	.0014	.7440
N 08	Remove and replace defrost timer	.4500	.0032	.0014	.7454
N 12	Remove and replace defrost terminator	.4500	.0027	.0012	.7466
N 13	Remove and replace relay	.4500	.0059	.0027	.7493
N 18	Remove restriction from capillary tube	.4500	.0033	.0015	.7508
N 29	Remove and replace humidistate	.4500	.0041	.0018	.7526
M 16	Check and adjust pressure motor control	.4250	.0069	.0029	.7555
M 20	Check icemaker for operation	.4250	.0042	.0018	.7573
N 11	Remove and replace defrost heater	.4250	.0026	.0011	.7584
N 24	Remove and replace high or low pressure motor control	.4250	.0077	.0033	.7617
D 03	Use oven tester	.4000	.0066	.0027	.7644
F 01	Troubleshoot & diagnose refrigerator or freezer problems	.4000	.0084	.0034	.7678
F 02	Replace or adjust thermostats	.4000	.0074	.0030	.7708
F 05	Repair and replace relays, overload devices	.4000	.0071	.0028	.7736
F 06	Repair & replace defroster controls, heater & timer	.4000	.0075	.0030	.7766
F 09	Adjust tubing to eliminate noise	.4000	.0068	.0027	.7793
F 10	Remove and install door gasket	.4000	.0053	.0021	.7814

		CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING	
RANKED BY PERCENT OF MEMBERS PERFORMING					
D-TSK	TASK TITLE				
F 13	Clean fins & tubing of condenser	.4000	.0063	.0025	.7839
G 01	Troubleshoot & diagnose range unit problems	.4000	.0069	.0028	.7867
G 02	Read & interpret wiring diagram	.4000	.0071	.0028	.7895
G 03	Test and replace switches	.4000	.0070	.0028	.7923
G 05	Test and replace thermostats	.4000	.0070	.0028	.7951
G 06	Test and replace automatic timers	.4000	.0068	.0027	.7978
G 08	Adjust doors	.4000	.0063	.0025	.8003
G 09	Repair light	.4000	.0052	.0021	.8024
G 13	Adjust and clean burners	.4000	.0054	.0022	.8046
G 14	Adjust and clean pilots	.4000	.0060	.0024	.8070
G 15	Test and replace thermostats	.4000	.0064	.0025	.8095
G 16	Test and replace timers	.4000	.0062	.0025	.8120
G 17	Repair light	.4000	.0052	.0021	.8141
G 18	Use oven test thermometer	.4000	.0069	.0028	.8169
H 01	Troubleshoot & diagnose washing machine problems	.4000	.0081	.0033	.8202
H 02	Replace timers	.4000	.0064	.0026	.8228
H 03	Replace solenoids	.4000	.0061	.0024	.8252
H 04	Replace or repair regular motor	.4000	.0058	.0023	.8275
H 05	Replace throw-away motor	.4000	.0062	.0025	.8300
H 06	Replace water pump	.4000	.0069	.0028	.8328
H 08	Clean or replace inlet valve	.4000	.0070	.0028	.8356
H 09	Replace belts	.4000	.0065	.0026	.8382
H 12	Test and replace control panel switches	.4000	.0064	.0026	.8408
H 13	Explain washability problems to customer	.4000	.0075	.0030	.8438
H 14	Adjust belts and pulleys	.4000	.0062	.0025	.8463
H 15	Analyze problem with timed fill switch	.4000	.0056	.0022	.8485
I 01	Troubleshoot & diagnose dryer problems	.4000	.0075	.0030	.8515
I 02	Replace timers	.4000	.0061	.0025	.8540
I 03	Replace thermostats	.4000	.0069	.0027	.8567
I 05	Replace motors	.4000	.0057	.0023	.8590

		CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
RANKED BY					
D-TSK	TASK TITLE				
I 06	Replace heating element	.4000	.0072	.0029	.8619
I 07	Replace drum seals (felts)	.4000	.0059	.0023	.8642
I 09	Clean lint from system	.4000	.0071	.0028	.8670
I 11	Test gas valve	.4000	.0060	.0024	.8694
I 12	Test and repair constant pilot	.4000	.0061	.0025	.8719
I 13	Test, repair or replace automatic pilot	.4000	.0068	.0027	.8746
I 14	Replace drum seals	.4000	.0059	.0023	.8769
I 15	Test and replace thermostats	.4000	.0067	.0027	.8796
I 16	Test and replace high limits switch	.4000	.0064	.0026	.8822
J 01	Troubleshoot & diagnose dishwasher problems	.4000	.0072	.0029	.8851
J 02	Replace motors	.4000	.0067	.0027	.8878
J 03	Replace solenoids	.4000	.0063	.0025	.8903
J 04	Clean or replace water valve	.4000	.0069	.0027	.8930
J 06	Replace pump, seal kit or pump assembly	.4000	.0072	.0029	.8959
J 07	Replace timers	.4000	.0061	.0024	.8983
J 08	Replace heating elements	.4000	.0050	.0020	.9003
J 09	Replace pump and motor assembly	.4000	.0069	.0028	.9031
F 11	Repair automatic icemaker	.3750	.0061	.0023	.9054
G 04	Test and replace surface units	.3750	.0070	.0026	.9080
G 10	Test, replace or repair self-cleaning oven unit	.3750	.0065	.0025	.9105
G 19	Change oven from natural gas to LP. gas	.3750	.0049	.0019	.9124
G 20	Repair self-cleaning oven	.3750	.0055	.0021	.9145
H 10	Check and repair overload protectors	.3750	.0049	.0018	.9163
I 08	Repair vent system	.3750	.0055	.0021	.9184
L 01	Troubleshoot and analyze problem	.3750	.0066	.0025	.9209
L 02	Clean condensers and evaporator	.3750	.0059	.0022	.9231
M 14	Check and adjust automatic expansion valve	.3750	.0069	.0026	.9257
F 03	Test, repair and replace compressors	.3500	.0058	.0020	.9277
F 08	Locate & repair refrigerant leak	.3500	.0056	.0020	.9297
G 07	Test, replace or repair automatic surface unit with sensors	.3500	.0056	.0020	.9317

CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS----------
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING---
RANKED BY PERCENT OF MEMBERS PERFORMING----------

D-	TSK	TASK TITLE				
I	04	Test & replace relays-overload switch	.3500	.0055	.0019	.9336
I	17	Clean vent system	.3500	.0062	.0022	.9358
K	01	Free stuck cutters	.3500	.0072	.0025	.9383
L	03	Replace blower motors	.3500	.0059	.0021	.9404
L	08	Test and replace shorting and running capicitors	.3500	.0058	.0020	.9424
M	04	Check circuitry on defrost equipment	.3500	.0030	.0010	.9434
A	03	Check service file for past service history	.3250	.0214	.0070	.9504
B	16	Cut internal and external threads	.3250	.0028	.0009	.9513
H	07	Repair trans-gear case	.3250	.0046	.0015	.9528
J	05	Replace overload switch	.3250	.0053	.0017	.9545
K	03	Replace motors	.3250	.0050	.0016	.9561
K	06	Repair or replace switches	.3250	.0051	.0016	.9577
L	06	Replace & adjust thermostats, relays & overloads	.3250	.0057	.0019	.9596
A	01	Answer telephone service call and make appt	.3000	.0484	.0145	.9741
G	11	Repair or replace electronic control boards	.3000	.0061	.0018	.9759
K	04	Check overload protectors	.3000	.0056	.0017	.9776
K	05	Replace cutters	.3000	.0045	.0014	.9790
L	04	Test, repair and replace compressors	.3000	.0053	.0016	.9806
L	07	Locate and repair refrigerant leak	.3000	.0049	.0015	.9821
L	09	Discharge and recharge system	.3000	.0055	.0016	.9837
F	04	Test, repair and replace evaporators	.2750	.0057	.0016	.9853
F	07	Repair or replace condensers	.2750	.0046	.0013	.9866
F	12	Service or replace capillary tube	.2750	.0051	.0014	.9880
I	10	Install dryer	.2750	.0039	.0011	.9891
J	10	Install dishwasher	.2750	.0033	.0009	.9900
K	02	Inspect and replace seals	.2750	.0056	.0015	.9915
G	12	Install range	.2500	.0032	.0008	.9923
H	11	Install washing machine	.2500	.0041	.0010	.9933
L	05	Repair and install capillary tubing	.2500	.0042	.0010	.9943
D	13	Use thermostat tester	.2250	.0057	.0013	.9956

		CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
RANKED BY					
D-TSK	TASK TITLE				
L 10	Install a window unit	.2250	.0031	.0007	.9963
B 15	Operate drill press	.2000	.0023	.0005	.9968
K 07	Install a food waste disposal-siphon break	.2000	.0046	.0009	.9977
N 19	Remove and replace capillary tube	.2000	.0056	.9911	.9988
D 15	Use a closed end manometer	.1750	.0039	.0007	.9995
N 26	Remove and replace hot gas defrost solenoid & valve	.1750	.0039	.0007	1.0002
N 27	Repair evaporator with epoxy	.1750	.0028	.0005	1.0007
C 28	Form, bend and hardface	.1000	.0031	.0003	1.0010
N 20	Remove & replace automatic expansion valve	.1000	.0061	.0006	1.0016

APPLIANCE REPAIR, REFRIGERATION & AIR CONDITIONER
TASK INVENTORY

BACKGROUND INFORMATION

1. Check your present job title:

   Appliance Repairman ____ Supervisor _____

   Refrigeration & Air Conditioning Repairman _____ Other (specify) _____

2. How many years have you worked as a repairman?

   ___ _ years

3. Where did you receive your training? (check one or more)

   On-the-job (self-learned) _____

   Military school _____

   Private vocational school _____

   Apprenticeship program _____

   High School program _____

   Community College Program _____

   Adult Education Program _____

4. Are you specialized in a mechanical service area?
   (e.g. washing machines & dryers or four ton A/C units)

   Yes _____ No _____

APPLIANCE REPAIR, REFRIGERATION AND AIR CONDITIONING
TASK INVENTORY

INSTRUCTIONS FOR COMPLETING TASK INVENTORY

Carefully read each of the Task Statements and place a check mark (✓) in the column labeled Check for each task which you perform on your present job.

After checking all tasks which you perform, then rate only the tasks you have checked by placing a number 1, 2, 3, 4 or 5 in the column labeled Time Spent which most closely estimates the amount of time you spend in performing the task.

Time spent means the total time you spend on each task you are rating, compared with the time you spend on each of the other tasks you do.

At the bottom on any page, write in and rate any tasks you do which are not listed.

APPLIANCE REPAIR, REFRIGERATION AND AIR CONDITIONING	Page 1 of 19 Pages	
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.	Check If Done	Time Spent 1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average
A. Working with the Public & Customer Relations	✓	
1. Answer telephone service call and make appt.		
2. Prepare service order		
3. Check service file for past service history		
4. Explain guarantee or warranty status		
5. Establish method of payment		
6. Obtain service schedule assignment from dispatcher		
7. Establish route & travel to destination		
8. Listen to customer's complaints & observations		
9. Test unit & diagnose trouble		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.	Check if Done	Time Spent 1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average
A. Working with the Public & Customer Relations (continued)	✓	
10. Explain malfunction & repairs needed		
11. Estimate job costs & explain to customer		
12. Perform service or repairs required		
13. Check unit for proper operation		
14. Clean-up servicing area & unit		
15. Complete the service order		
16. Obtain customer's signature		
17. Make call-back to check customer satisfaction		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

B. Using Hand and Power Tools	Check If Done ✓	Time Spent 1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average
1. Identify and replace unsafe tools		
2. Care for and maintain hand tools		
3. Measure with steel rule or tape		
4. Use screwdrivers		
5. Use wrenches, sockets and nutdrivers		
6. Use torque wrench		
7. Cut metal with hack saw		
8. Use chisels		
9. Use punches		
10. Use hammers and mallets		
11. File metal		
12. Use pliers and wire strippers		
13. Operate bench grinder		
14. Operate electric hand drill		
15. Operate drill press		
16. Cut internal and external threads		
17. Use flaring and swaging tools		
18. Use tube cutting and reaming tools		
19. Use refrigeration charging tools		
20. Use flywheel pullers		
21. Use pump service tools		
22. Use hand truck		
23. Use dollie		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.	Check If Done	Time Spent 1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average
C. Soldering, Brazing and Welding	✓	
Soft Soldering		
1. Fit parts & clean surfaces		
2. Apply flux		
3. Operate soldering gun, copper or torch		
4. Clean joints (flux)		
Brazing		
5. Fit mating parts & establish clearances		
6. Clean metal		
7. Assemble & support parts		
8. Apply flux		
9. Adjust regulator		
10. Light torch		
11. Adjust flame		
12. Braze mild steel		
13. Braze cast iron		
14. Silver braze stainless steel		
15. Silver braze copper alloys		
16. Clean joints (flux)		
17. Shut off valve & bleed off acetylene		
Oxyacetylene Welding		
18. Set up and test equipment		
19. Fit mating parts		
20. Clamp and support parts		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.	Check If Done	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
C. Soldering, Brazing and Welding (continued)	✓	
Oxyacetylene Welding continued		
21. Select proper rod & torch tips		
22. Light torch		
23. Adjust flame		
24. Weld mild steel		
25. Weld pipe		
26. Weld cast iron		
27. Cut using oxyacetylene		
28. Form, bend and hardface		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

D. Testing Electrical Circuits and Components	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
1. Identify electric components		
2. Read electrical wiring diagrams		
3. Use oven tester		
4. Use thermocouple temperature tester		
5. Use ohmmeter		
6. Use volt-ohmmeter		
7. Use volt-wattmeter		
8. Use clamp-on volt ammeter		
9. Use test probes		
10. Use dial thermometer		
11. Use thermistor temperature tester		
12. Use time and temperature recorder		
13. Use thermostat tester		
14. Use sling psychrometer		
15. Use a closed end manometer		
16. Wire circuits and check measurements		
17. Adjust and test switches		
18. Check circuit protective devices		
19. Replace wires and make connections		
20. Check a current relay		
21. Check a potential relay		
22. Check a thermal relay		
23. Check a solid state relay		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

D. Testing Electrical Circuits and Components (continued)	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
24. Check a solenoid valve		
25. Check and adjust a thermostat		
26. Dismantle, repair & assemble a single-phase motor		
27. Check components & wiring of a 24 volt circuit		
28. Check components & wiring of a 120 volt circuit		
29. Check components & wiring of a 240 volt circuit		
30. Test an open type capacitor-start motor		
31. Test a capacitor-start hermetic motor		
32. Test & operate a capacitor-start capacitor-run hermetic motor		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

E. Making Mechanical Repairs	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
1. Identify assembly devices and tools		
2. Make flared tube connections		
3. Repair soldered or brazed connection		
4. Make a swaged tubing connection		
5. Make a complete tubing assembly		
6. Operate gauge manifold		
7. Operate service valves		
8. Install & test access valves & process tube adaptors		
9. Dismantle, assemble and test external drive piston type compressor		
10. Dismantle, assemble and test an external drive rotary type compressor		
11. Install belts and adjust pulleys and belts		
12. Measure temperatures		
13. Test for leaks		
14. Install gauges on an external drive refrigerating system		
15. Repair a leak using epoxy compounds		
16. Evacuate a system		
17. Use a service cylinder		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

F. Repairing Refrigerators and Freezers	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
1. Troubleshoot & diagnose refrigerator or freezer problems		
2. Replace or adjust thermostats		
3. Test, repair and replace compressors		
4. Test, repair and replace evaporators		
5. Repair and replace relays, overload devices		
6. Repair & replace defroster controls, heater and timer		
7. Repair or replace condensers		
8. Locate & repair refrigerant leak		
9. Adjust tubing to eliminate noise		
10. Remove and install door gasket		
11. Repair automatic icemaker		
12. Service or replace capillary tube		
13. Clean fins & tubing of condenser		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

G. Repairing Ranges	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
Electric		
1. Troubleshoot & diagnose range unit problems		
2. Read & interpret wiring diagram		
3. Test and replace switches		
4. Test and replace surface units		
5. Test and replace thermostats		
6. Test and replace automatic timers		
7. Test, replace or repair automatic surface unit with sensors		
8. Adjust doors		
9. Repair light		
10. Test, replace or repair self-cleaning oven unit		
11. Repair or replace electronic control boards		
12. Install range		
Gas		
13. Adjust and clean burners		
14. Adjust and clean pilots		
15. Test and replace thermostats		
16. Test and replace timers		
17. Repair light		
18. Use oven test thermometer		
19. Change oven from natural gas to LP. gas		
20. Repair self-cleaning oven		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

H. Repairing Washing Machines	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
1. Troubleshoot & diagnose washing machine probs.		
2. Replace timers		
3. Replace solenoids		
4. Replace or repair regular motor		
5. Replace throw-away motor		
6. Replace water pump		
7. Repair trans-gear case		
8. Clean or replace inlet valve		
9. Replace belts		
10. Check and repair overload protectors		
11. Install washing machine		
12. Test and replace control panel switches		
13. Explain washability problems to customer		
14. Adjust belts and pulleys		
15. Analyze problem with timed fill switch		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

I. Repairing Dryers	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
Electric		
1. Troubleshoot & diagnose dryer problems		
2. Replace timers		
3. Replace thermostats		
4. Test & replace relays-overload switch		
5. Replace motors		
6. Replace heating element		
7. Replace drum seals (felts)		
8. Repair vent system		
9. Clean lint from system		
10. Install dryer	✓	
Gas		
11. Test gas valve		
12. Test and repair constant pilot		
13. Test, repair or replace automatic pilot		
14. Replace drum seals		
15. Test and replace thermostats		
16. Test and replace high limits switch		
17. Clean vent system		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

J. Repairing Dishwashers	Check If Done	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
	✓	
1. Troubleshoot & diagnose dishwasher problems		
2. Replace motors		
3. Replace solenoids		
4. Clean or replace water valve		
5. Replace overload switch		
6. Replace pump, seal kit or pump assembly		
7. Replace timers		
8. Replace heating elements		
9. Replace pump and motor assembly		
10. Install dishwasher		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

K. Repairing Disposals	Check If Done	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
	✓	
1. Free stuck cutters		
2. Inspect and replace seals		
3. Replace motors		
4. Check overload protectors		
5. Replace cutters		
6. Repair or replace switches		
7. Install a food waste disposal-siphon break		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

L. Repairing Window Air Conditioners	Check If Done	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
1. Troubleshoot and analyze problem	✓	
2. Clean condensers and evaporator		
3. Replace blower motors		
4. Test, repair and replace compressors		
5. Repair and install capillary tubing		
6. Replace and adjust thermostats, relays and overloads		
7. Locate and repair refrigerant leak		
8. Test and replace shorting and running capacitors		
9. Discharge and recharge system		
10. Install a window unit		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

M. Troubleshooting Refrigeration and Air Conditioning Equipment	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
1. Hook hermetic compressor directly to power supply		
2. Check circuitry of the compressor protector and relay		
3. Check relay		
4. Check circuitry on defrost equipment		
5. Check circulation fan motors		
6. Check and adjust control thermostat		
7. Attach manifold and gauges to service valves and check pressure		
8. Install in-line service valves and measure pressures		
9. Check compressor efficiency		
10. Locate leak in a refrigeration system using electronic leak detector		
11. Locate leak in a refrigeration system using halide torch		
12. Locate leak in a refrigeration system using bubble method		
13. Check unit operation-oil level-sight glass-moisture indicator		
14. Check and adjust automatic expansion valve		
15. Check, test and adjust thermostatic expansion valve		
16. Check and adjust pressure motor control		
17. Check and adjust low pressure safety control		
18. Check and adjust high pressure safety control		
19. Adjust and calibrate oil pressure control		
20. Check icemaker for operation		
21. Check and adjust water valve		
22. Check hot gas defrost solenoid and valve		
23. Check humidity with sling psychrometer		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.	Check If Done	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
M. Troubleshooting Refrigeration and Air Conditioning Equipment (continued)	✓	
24. Check and adjust humidstat		
25. Check condensate pump and drain		
26. Check blower assembly and filter		
27. Check heat pump reversing system		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

N. Servicing & Repairing Refrigeration & Air Conditioning Equipment	Check If Done ✓	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
1. Evacuate a refrigeration system		
2. Pump system down into receiving tank		
3. Recharge system using sight glass		
4. Recharge system weighing in refrigerent		
5. Fill dial a charge		
6. Recharge a refrigeration system using dial a charge		
7. Remove and replace control thermostat		
8. Remove and replace defrost timer		
9. Remove and replace motor overload protector		
10. Remove and replace capacitor		
11. Remove and replace defrost heater		
12. Remove and replace defrost terminator		
13. Remove and replace relay		
14. Remove and replace fan motors		
15. Repair leak in copper lines of system		
16. Remove and replace compressor		
17. Add oil to system		
18. Remove restriction from capillary tube		
19. Remove and replace capillary tube		
20. Remove and replace automatic expansion valve		
21. Remove and replace thermostatic expansion valve		
22. Install a drier, sight glass or moisture indicator		
23. Remove and replace high or low pressure safety control		

Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

N. Servicing & Repairing Refrigeration & Air Conditioning Equipment (continued)	Check If Done	Time Spent (1. Below Average 2. Slightly Below Average 3. Average 4. Slightly Above Average 5. Above Average)
24. Remove and replace high or low pressure motor control		
25. Remove and replace oil pressure safety control		
26. Remove and replace hot gas defrost solenoid and valve		
27. Repair evaporator with epoxy	✓	
28. Remove and replace condensation pump motor		
29. Remove and replace humidistat		
30. Balance the air conditioning system		
31. Check and replace filters - clean indoor & outdoor coils		